اختبار نهاية الفصل في الدوال الأسية والمتباينات والمعادلات الأسية



تم تحميل هذا الملف من موقع المناهج الإماراتية
موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف الحادي عشر المتقدم ⇦ رياضيات ⇦ الفصل الأول ⇦ اختبارات ⇦ الملف
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المزيد من مادة رياضيات:	ملفات ا كتب للمعلم ا كتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس

التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم					
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المواد على تلغرام	التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات	

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الأول	
1	اختبار نهاية الفصل في الدوال الأسية والمتباينات والمعادلات الأسية
2	اختبار تجريبي هيكل ريفيل
3	هيكل – أوراق عمل رمز الفترة
4	أسئلة الهيكل الوزاري – الجزء الكتابي (بدون حل) – نهاية الفصل – بريدج
5	كل ما يخص اليوم الأول في الامتحان 25/11/2026

تحميل تطبيق المناهج للهواتف الذكية	
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Student Name:..... Grade: .....

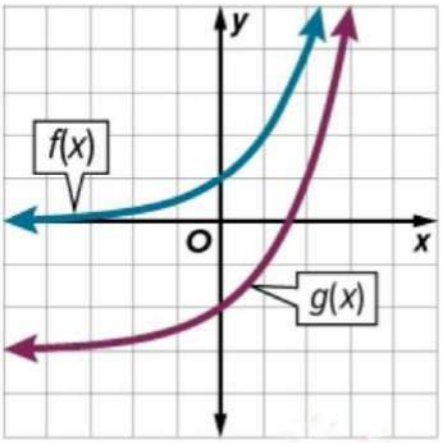
PART 1 : MULTIPLE CHOICE

1 **Reveal:** Graph exponential growth functions
Exercises (11-13) Page 221

Q1 1.1

Identify the value of k and write a function $g(x) = f(x) + k$ for the graph $f(x) = 2^x$

Student Work:



A $k = 3,\ g(x) = 2^x - 3$

B $k = -3,\ g(x) = 2^x - 3$

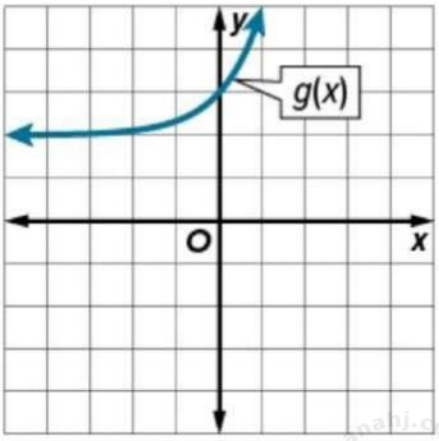
C $k = 3,\ g(x) = 2^x + 3$

D $k = -3,\ g(x) = 2^{x-3}$

Q2 1.2

Identify the value of k and write a function $g(x) = f(x) + k$ for the graph $f(x) = 3^x$

Student Work:



A $k = 2,\ g(x) = 3^x + 2$

B $k = -2,\ g(x) = 3^x - 2$

C $k = -2,\ g(x) = 3^{x-2}$

D $k = 4,\ g(x) = 3^{x-2}$

Q3 (1.3)

Identify the value of k and write a function $g(x) = k \cdot f(x)$ for the graph:

$$f(x) = \left(\frac{3}{2}\right)^x$$

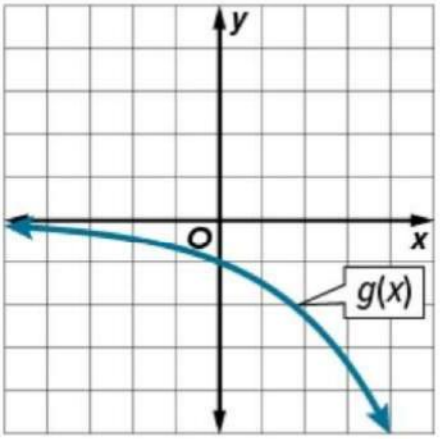
Student Work:

(A) $k = -2,\ g(x) = -2 \cdot \left(\frac{3}{2}\right)^x$

(B) $k = -3,\ g(x) = \left(\frac{3}{2}\right)^x - 3$

(C) $k = -1,\ g(x) = -1 \cdot \left(\frac{3}{2}\right)^x$

(D) $k = -1,\ g(x) = \left(\frac{3}{2}\right)^{-x}$



Q4 (1.4)

Describe the transformation $g(x) = 2 \cdot 2^x$ as it relates to the parent function $f(x) = 2^x$:

Student Work:

(A) Vertical stretch by a factor of 2

(B) Vertical compression by a factor of 2

(C) Horizontal stretch by 2

(D) Horizontal compression by 2

2 **Reveal:** Solve exponential inequalities and equations
Exercises (23, 29, 32, 34) Page 230

KEY CONCEPT | Property of Inequality for Exponential Equations

If $b > 1$, then:

>	$b^x > b^y$	if and only if	$x > y$
<	$b^x < b^y$	if and only if	$x < y$

Q5 2.1

Solve the exponential inequality:

$$625 \geq 5^{a+8}$$

Student Work:

(A) $a \leq -4$ (B) $a \geq -4$ (C) $a \leq 4$ (D) $a \geq 4$

Q6 2.2

Solve the exponential inequality:

$$\left(\frac{1}{64}\right)^{c-2} < 32^{2c}$$

Student Work:

(A) $c < \frac{3}{4}$ (B) $c > \frac{3}{4}$ (C) $c < -\frac{3}{4}$ (D) $c > -\frac{3}{4}$

Q7 (2.3)

Solve the exponential inequality:

$$10^{5b+2} > 1000$$

Student Work:

(A) $b > 0.2$ (B) $b < 0.2$ (C) $b > 2$ (D) $b < 2$

Q8 (2.4)

Solve the exponential inequality:

$$\left(\frac{1}{9}\right)^{3t+5} < \left(\frac{1}{243}\right)^{t-6}$$

Student Work:

(A) $t < -40$ (B) $t > -40$ (C) $t > 40$ (D) $t < 40$

3 **Reveal: Write logarithmic expressions in exponential form and write exponential expressions in logarithmic form**
Exercises (1 - 12) Pages 265

Key Concept	Logarithms with Base b
Words	Let b and x be positive numbers, $b \neq 1$. The logarithm of x with base b is denoted $\log_b x$ and is defined as the exponent y that makes the equation $b^y = x$ true.
Symbols	Suppose $b > 0$ and $b \neq 1$. For $x > 0$, there is a number y such that $\log_b y = y$ if and only if $b^y = x$.
Example	If $\log_2 8 = y$, then $2^y = 8$.

Q9 (3.1)

Write the logarithmic equation in exponential form:

$$\log_{15} 225 = 2$$

Student Work:

(A) $15^2 = 225$ (B) $15^2 = 255$ (C) $2^{15} = 225$ (D) $15^{-2} = 225$

Q10 (3.2)

Write the logarithmic equation in exponential form:

$$\log_3 \frac{1}{27} = -3$$

Student Work:

(A) $3^{-3} = \frac{1}{27}$ (B) $3^3 = 27$ (C) $(-3)^3 = \frac{1}{27}$ (D) $3^{-1/3} = 27$

Q11 (3.3)

Write the logarithmic equation in exponential form:

$$\log_5 \frac{1}{25} = -2$$

Student Work:

(A) $5^2 = \frac{1}{25}$ (B) $5^{-2} = \frac{1}{25}$ (C) $2^{-5} = 25$ (D) $(-5)^2 = \frac{1}{25}$

Q12 3.4

Write the logarithmic equation in exponential form:

$$\log_3 243 = 5$$

Student Work:

(A) $3^5 = 243$ (B) $3^4 = 243$ (C) $5^3 = 243$ (D) $3^{-5} = 243$

Q13 3.5

Write the logarithmic equation in exponential form:

$$\log_4 64 = 3$$

Student Work:

(A) $4^3 = 64$ (B) $4^4 = 64$ (C) $3^4 = 64$ (D) $4^{-3} = 64$

Q14 3.6

Write the logarithmic equation in exponential form:

$$\log_4 32 = \frac{5}{2}$$

Student Work:

(A) $4^{5/2} = 32$ (B) $4^{2/5} = 32$ (C) $32^{5/2} = 4$ (D) $4^{-5/2} = 32$

Q15 3.7

Write the exponential equation in logarithmic form:

$$2^7 = 128$$

Student Work:

(A) $\log_2 128 = 7$

(B) $\log_7 128 = 2$

(C) $\log_2 7 = 128$

(D) $\log_{128} 2 = 7$

Q16 3.8

Write the exponential equation in logarithmic form:

$$3^{-4} = \frac{1}{81}$$

Student Work:

(A) $\log_3 \frac{1}{81} = -4$

(B) $\log_{-4} \frac{1}{81} = 3$

(C) $\log_3(-4) = \frac{1}{81}$

(D) $\log_{1/81} 3 = -4$

Q17 3.9

Write the exponential equation in logarithmic form:

$$7^{-2} = \frac{1}{49}$$

Student Work:

(A) $\log_7 \frac{1}{49} = -2$

(B) $\log_{-2} \frac{1}{49} = 7$

(C) $\log_7(-2) = \frac{1}{49}$

(D) $\log_{1/49} 7 = -2$

Q18 3.10

Write the exponential equation in logarithmic form:

$$\left(\frac{1}{7}\right)^{3} = \frac{1}{343}$$

Student Work:

(A) $\log_{1/7} \frac{1}{343} = 3$

(B) $\log_{3} \frac{1}{343} = \frac{1}{7}$

(C) $\log_{1/7} 3 = \frac{1}{343}$

(D) $\log_{343} \frac{1}{7} = 3$

Q19 3.11

Write the exponential equation in logarithmic form:

$$2^{9} = 512$$

Student Work:

(A) $\log_{2} 512 = 9$

(B) $\log_{9} 512 = 2$

(C) $\log_{2} 9 = 512$

(D) $\log_{512} 2 = 9$

Q20 3.12

Write the exponential equation in logarithmic form:

$$64^{\frac{2}{3}} = 16$$

Student Work:

(A) $\log_{64} 16 = \frac{2}{3}$

(B) $\log_{\frac{2}{3}} 16 = 64$

(C) $\log_{64} \frac{2}{3} = 16$

(D) $\log_{16} 64 = \frac{2}{3}$

4 **Reveal:** Solve logarithmic equations using the properties of logarithms
Exercises (7-12) Page 273

Key Concept • Property of Equality for Logarithmic Equations	
Symbols	If $\log_b x = \log_b y$, then $x = y$, where $b > 0$, $b \neq 1$.
Example	If $\log_4 16 = \log_4 2$, then $16 = 2$. or $\log_4 8 = \log_4 2$, then $8 = 2$.

Q21 (4.1)

Find the value of x that makes the equation true:

$$\log_4(2x^2 - 4x) = \log_4 2x$$

Student Work:

(A) $x = -2$ (B) $x = 0$ (C) $x = 3$ (D) $x = 6$

Q22 (4.2)

Solve the logarithmic equation:

$$\log_5(x^2 - 6) = \log_5 x$$

Student Work:

(A) $x = -2$ (B) $x = 3$ (C) $x = 6$ (D) $x = 8$

Q23 (4.3)

Solve the logarithmic equation:

$$\log_3(x^2 - 8) = \log_3 2x$$

Student Work:

(A) $x = 4$ (B) $x = -2$ (C) $x = 2$ (D) $x = 8$

Q24 (4.4)

Solve the logarithmic equation:

$$\log_4(2x^2 - 20) = \log_4 6x$$

Student Work:

(A) $x = -2$ or $x = 5$ (B) $x = 3$

(C) $x = -2$ (D) $x = 5$

Q25 (4.5)

Solve the logarithmic equation:

$$\log_2(6x^2 + 1) = \log_2 5x$$

Student Work:

(A) $x = \frac{1}{2}$ or $x = \frac{1}{3}$ (B) $x = 2$

(C) $x = 3$ (D) $x = -1$

Q26 (4.6)

Solve the logarithmic equation:

$$\log_6(6x^2 - 3) = \log_6 7x$$

Student Work:

(A) $x = -\frac{1}{3}$

(B) $x = \frac{2}{3}$

(C) $x = \frac{3}{2}$

(D) $x = -\frac{1}{3}$ or $x = \frac{3}{2}$

Q27 (4.7)

Solve the logarithmic equation:

$$5\log_2(x) = \log_2 32$$

Student Work:

(A) $x = 32$

(B) $x = 2$

(C) $x = 5$

(D) $x = 10$

Q28 (4.8)

Solve the logarithmic equation:

$$\log_3 \frac{x^2}{4} = \log_3 25$$

(A) $x = 10$ or $x = -10$

(B) $x = 10$

(C) $x = -10$

(D) $x = 100$

Q29 (4.9)

Solve the logarithmic equation:

$$\log_3(3d) = \log_3 9$$

Student Work:

(A) $d = 1$

(B) $d = 2$

(C) $d = 3$

(D) $d = 9$

Q30 4.10

Solve the logarithmic equation:

$$\log_{10}(3x^2 - 5x) = \log_{10} 2$$

Student Work:

(A) $x = 1$

(B) $x = 3$

(C) $x = -2$ or $x = \frac{1}{3}$

(D) $x = 2$ or $x = -\frac{1}{3}$

Q31 4.11

Solve the logarithmic equation:

$$\log_4(2x^2 - 3x) = \log_4 2$$

Student Work:

(A) $x = 2$ or $x = -\frac{1}{2}$

(B) $x = -2$ or $x = \frac{1}{2}$

(C) $x = 4$

(D) $x = 1$

Q32 4.12

Solve the logarithmic equation:

$$\log_{11}(x^2 + 5x - 108) = \log_{11} 28x$$

Student Work:

(A) $x = -4$

(B) $x = 27$

(C) $x = 18$

(D) $x = -7$

5 **Reveal: Evaluate logarithmic expressions using the Change of Base Formula**
Example 5 Page 279

Key Concept | Change of Base Formula	
Symbols	For all positive numbers a, b, and n, where $a \neq 1$ and $b \neq 1$, $\log_a n = \frac{\log_b n}{\log_b a}$ Use this formula to convert from one base to another.
Example	$\log_4 7 = \frac{\log 7}{\log 4}$

Q33 **5.1**

Evaluate $\log_2 11$ by writing it in terms of common logarithms. Round to the nearest ten-thousandth.

Student Work:

(A) 2.4594 (B) 3.4594 (C) 4.4594 (D) 3.1245

Q34 **5.2**

Evaluate $\log_4 22$ by writing it in terms of common logarithms. Round to the nearest ten-thousandth.

Student Work:

(A) 1.2297 (B) 3.2297 (C) 2.2297 (D) 2.5412

Q35 **5.3**

Express $\log_{12} 200$ in terms of common logarithms. Then approximate its value to the nearest ten-thousandth.

Student Work:

(A) $\frac{\log 200}{\log 12}$ (B) $\frac{\log 12}{\log 200}$

(C) $\log 200 - \log 12$ (D) $\frac{\log 200}{12}$

Q36 5.4

Express $\log_2 50$ in terms of common logarithms. Then approximate its value to the nearest ten-thousandth.

Student Work:

(A) $\frac{\log 2}{\log 50}$

(B) $\log 50 - \log 2$

(C) $\frac{\log 50}{2}$

(D) $\frac{\log 50}{\log 2}$

Q37 5.5

Which expression is equivalent to $\log_8 15$ using base 10?

Student Work:

(A) $\frac{\log 8}{\log 15}$

(B) $\frac{\log 15}{\log 8}$

(C) $\log 15 \cdot \log 8$

(D) $\log 15 - \log 8$

Q38 5.6

Which expression is equivalent to $\log_5 2.4$ using base 10?

Student Work:

(A) $\frac{\log 5}{\log 2.4}$

(B) $\log 2.4 - \log 5$

(C) $\frac{\log 2.4}{\log 5}$

(D) $\log 2.4 \cdot \log 5$

6 **Reveal:** **Evaluate expressions involving the natural base and natural logarithm**
Example 3 Page 286

Q39 **6.1**

Write as a single logarithm:

$$\frac{1}{3}\ln 8 - \ln 3 + \ln 9$$

Student Work:

(A) $\ln 6$ (B) $\ln 18$ (C) $\ln 2$ (D) $\ln 54$

Q40 **6.2**

Write as a single logarithm:

$$\ln 7 - \frac{1}{3}\ln 27 + \ln 6$$

Student Work:

(A) $\ln 14$ (B) $\ln 42$ (C) $\ln 21$ (D) $\ln 7$

Q41 **6.3**

Write each expression as a single logarithm:

$$3\ln 3 - \ln 9$$

Student Work:

(A) $\ln 3$ (B) $\ln 1$ (C) $\ln 9$ (D) $\ln 27$

Q42 6.4

Write each expression as a single logarithm:

$$4\ln 16 - \ln 256$$

Student Work:

(A) $\ln 256$ (B) $\ln 1$ (C) $\ln 16$ (D) $\ln 4$

Q43 6.5

Write each expression as a single logarithm:

$$2\ln x + 2\ln 4$$

Student Work:

(A) $\ln(16x^2)$ (B) $\ln(8x^2)$ (C) $\ln(4x^2)$ (D) $\ln(2x+4)$

Q44 6.6

Write each expression as a single logarithm:

$$3\ln 4 + 3\ln 3$$

Student Work:

(A) $\ln 1728$ (B) $\ln 144$ (C) $\ln 432$ (D) $\ln 12$

Q45 6.7

Write each expression as a single logarithm:

$$\ln 125 - 2\ln 5$$

Student Work:

(A) $\ln 5$ (B) $\ln 25$ (C) $\ln 1$ (D) $\ln 125$

Q46 6.8

Write each expression as a single logarithm:

$$3\ln 10 + 2\ln 100$$

Student Work:

(A) $\ln 10,000,000$ (B) $\ln 1,000,000$ (C) $\ln 100,000$ (D) $\ln 10,000$

Q47 6.9

Write each expression as a single logarithm: $4\ln\frac{1}{3} - 6\ln\frac{1}{9}$

Student Work:

(A) $\ln 6561$ (B) $\ln 2187$ (C) $\ln 729$ (D) $\ln 81$

Q48 6.10

Write each expression as a single logarithm: $7\ln\frac{1}{2} + 5\ln 2$

Student Work:

(A) $\ln 0.25$ (B) $\ln 0.5$ (C) $\ln 2$ (D) $\ln 4$

Q49 6.11

Write each expression as a single logarithm:

$$8\ln x - 4\ln 5$$

Student Work:

(A) $\ln\left(\frac{x^8}{625}\right)$ (B) $\ln\left(\frac{x^8}{5}\right)$

(C) $\ln(x^8 - 625)$ (D) $\ln\left(\frac{8x}{5}\right)$

7 **Reveal: Simplify rational expressions**
Example 1 Page 311

Q50 **7.1**

Simplify the expression, and state when the original expression is undefined:

$$\frac{x^2 - 2x - 24}{2x^3 + 6x^2 - 8x}$$

A $\frac{x-6}{2x(x-1)}$; undefined for $x = -4, 0, 1$

B $\frac{x+6}{2x(x-1)}$; undefined for $x = 0, 1$

C $\frac{x-6}{2x}$; undefined for $x = -4, 1$

D $\frac{x-6}{2x(x-1)}$; undefined for $x = 0, 1$

Q51 **7.2**

Simplify the expression, and state when the original expression is undefined:

$$\frac{x(x-3)(x+6)}{x^2 + x - 12}$$

A $\frac{x(x+6)}{x+4}$; undefined for $x = -4, 3$

B $\frac{x(x-3)}{x-4}$; undefined for $x = 4, -3$

C $\frac{x+6}{x+4}$; undefined for $x = -4$

D $\frac{x}{x+4}$; undefined for $x = -4, 3$

Q52 7.3

Simplify the expression, and state when the original expression is undefined:

$$\frac{y^2+3y+2}{2y(y-4)(y+2)}$$

(A) $\frac{y+1}{2y(y-4)}$; undefined for $y=-2,0,4$

(B) $\frac{y+2}{2y(y-4)}$; undefined for $y=0,4$

(C) $\frac{y+1}{2y(y-4)}$; undefined for $y=0,4$

(D) $\frac{y+1}{y-4}$; undefined for $y=-2,4$

Q53 7.4

Simplify the expression, and state when the original expression is undefined:

$$\frac{(x^2-9)(x^2-z^2)}{4(x+z)(x-3)}$$

(A) $\frac{(x-3)(x-z)}{4}$; undefined for $x=-z,3$

(B) $\frac{(x+3)(x-z)}{4}$; undefined for $x=-z,3$

(C) $\frac{(x+3)(x+z)}{4}$; undefined for $x=3$

(D) $\frac{(x-3)(x+3)}{4}$; undefined for $x=-z$

Q54 7.5

Simplify the expression, and state when the original expression is undefined:

$$\frac{(x^2-16x+64)(x+2)}{(x^2-64)(x^2-6x-16)}$$

Student Work:

(A) $\frac{1}{x+8}$; undefined for $x=-8,-2,8$

(B) $\frac{x-8}{x+8}$; undefined for $x=-8,8$

(C) $\frac{1}{x-8}$; undefined for $x=-8,-2,8$

(D) $\frac{x+2}{x+8}$; undefined for $x=-8,-2,8$

8 **Reveal: Simplify complex algebraic fractions including rational expressions**
Exercises (16-19) Page 323

Q55 **8.1**

Simplify the complex rational expression:

$$\frac{\frac{2}{x-3}+\frac{3x}{x^2-9}}{\frac{3}{x+3}-\frac{4x}{x^2-9}}$$

Student Work:

A $-\frac{5x+6}{x+9}$

B $\frac{5x+6}{x+9}$

C $-\frac{5x-6}{x+9}$

D $-\frac{5x+6}{x-9}$

Q56 **8.2**

Simplify the complex rational expression:

$$\frac{\frac{4}{x+5}+\frac{9}{x-6}}{\frac{5}{x-6}-\frac{8}{x+5}}$$

Student Work:

A $\frac{13x+21}{73-3x}$

B $\frac{13x-21}{73-3x}$

C $\frac{13x+21}{3x-73}$

D $\frac{13x+21}{-3x-73}$

Q57 8.3

Simplify the complex rational expression:

$$\frac{\frac{5}{x+6} - \frac{2x}{2x-1}}{\frac{x}{2x-1} + \frac{4}{x+6}}$$

Student Work:

(A) $\frac{-2x^2 - 2x - 5}{x^2 + 14x - 4}$

(B) $\frac{2x^2 + 2x + 5}{x^2 + 14x - 4}$

(C) $\frac{-2x^2 - 2x - 5}{x^2 - 14x - 4}$

(D) $\frac{-2x^2 + 2x - 5}{x^2 + 14x - 4}$

Q58 8.4

Simplify the complex rational expression:

$$\frac{\frac{8}{x-9} - \frac{x}{3x+2}}{\frac{3}{3x+2} + \frac{4x}{x-9}}$$

Student Work:

(A) $\frac{-x^2 + 33x + 16}{12x^2 + 11x - 27}$

(B) $\frac{x^2 + 33x + 16}{12x^2 + 11x - 27}$

(C) $\frac{-x^2 + 33x + 16}{12x^2 - 11x - 27}$

(D) $\frac{-x^2 - 33x + 16}{12x^2 + 11x - 27}$

9 **Reveal:** Graph transformations of reciprocal functions
Exercises (13-16) Page 333

Q59 9.1

State the domain and range for the reciprocal function:

$$f(x) = \frac{1}{x+3} - 3$$

Student Work:

(A) Domain: $x \neq -3$, Range: $y \neq -3$

(B) Domain: $x \neq 3$, Range: $y \neq -3$

(C) Domain: $x \neq -3$, Range: $y \neq 3$

(D) Domain: $x \neq 3$, Range: $y \neq 3$

Q60 9.2

State the domain and range for the reciprocal function:

$$f(x) = \frac{-1}{x+5} - 6$$

Student Work:

(A) Domain: $x \neq -5$, Range: $y \neq -6$

(B) Domain: $x \neq 5$, Range: $y \neq -6$

(C) Domain: $x \neq -5$, Range: $y \neq 6$

(D) Domain: $x \neq 5$, Range: $y \neq 6$

Q61 9.3

State the domain and range for the reciprocal function:

$$f(x) = \frac{-1}{x+1} + 3$$

Student Work:

(A) Domain: $x \neq -1$, Range: $y \neq 3$

(B) Domain: $x \neq 1$, Range: $y \neq 3$

(C) Domain: $x \neq -1$, Range: $y \neq -3$

(D) Domain: $x \neq 1$, Range: $y \neq -3$

Q62 9.4

State the domain and range for the reciprocal function:

$$f(x) = \frac{1}{x+4} - 2$$

Student Work:

(A) Domain: $x \neq -4$, Range: $y \neq -2$

(B) Domain: $x \neq 4$, Range: $y \neq -2$

(C) Domain: $x \neq -4$, Range: $y \neq 2$

(D) Domain: $x \neq 4$, Range: $y \neq 2$

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Q63 9.5

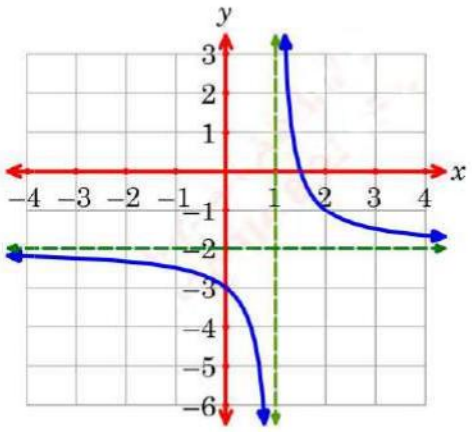
Which of the following functions represented by the graph shown?

(A) $f(x) = \dfrac{1}{x+1} - 2$

(B) $f(x) = \dfrac{1}{x-1} - 2$

(C) $f(x) = \dfrac{-1}{x+1} + 3$

(D) $f(x) = \dfrac{1}{x+4} - 2$



Q64 9.6

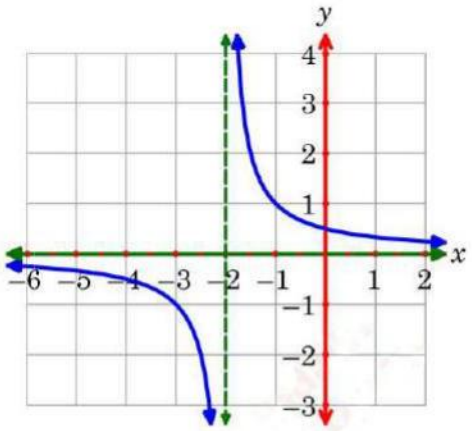
Which of the following functions represented by the graph shown?

(A) $f(x) = \dfrac{2}{x+2}$

(B) $f(x) = \dfrac{2}{x} - 2$

(C) $f(x) = \dfrac{-2}{x+2} + 1$

(D) $f(x) = \dfrac{1}{x+2}$



Q65 9.7

Use the graph to determine the domain and the range of the function.

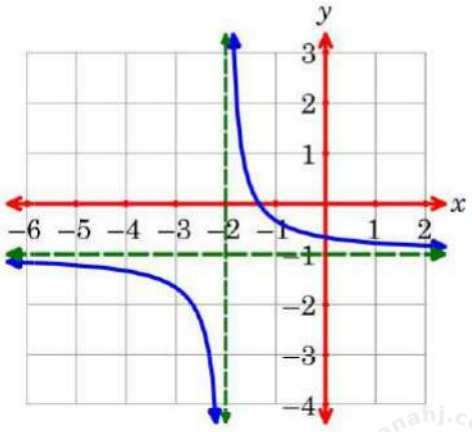
$$f(x) = \frac{2}{3x+6} - 1$$

(A) Domain: $\{x \mid x \neq 2\}$, Range: $\{y \mid y \neq -1\}$

(B) Domain: $\{x \mid x \neq -2\}$, Range: $\{y \mid y \neq 1\}$

(C) Domain: $\{x \mid x \neq -2\}$, Range: $\{y \mid y \neq -1\}$

(D) Domain: $\{x \mid x \neq 3\}$, Range: $\{y \mid y \neq -1\}$

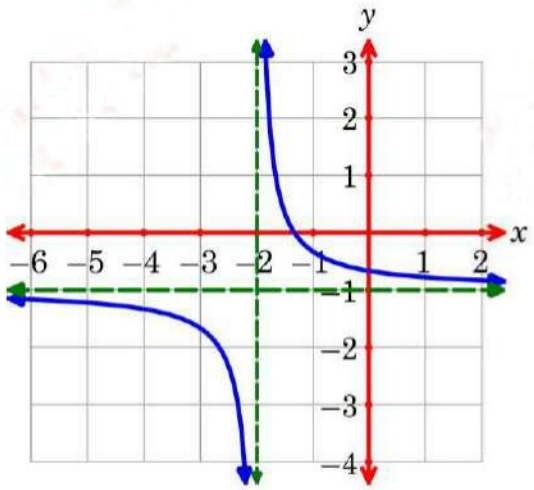


Q66 9.8

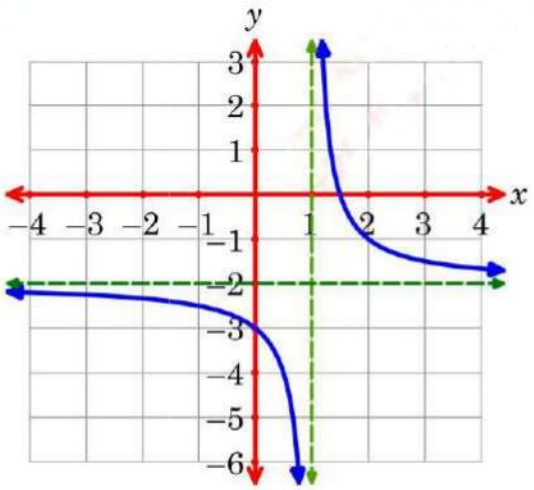
Which of the following graphs represents by the following function?

$$f(x) = \frac{1}{x+4} - 2$$

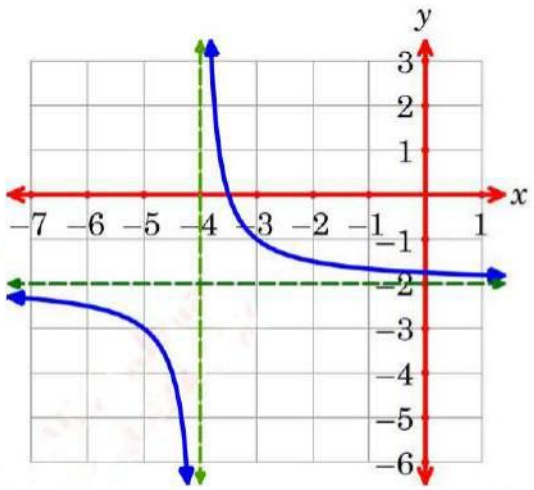
A



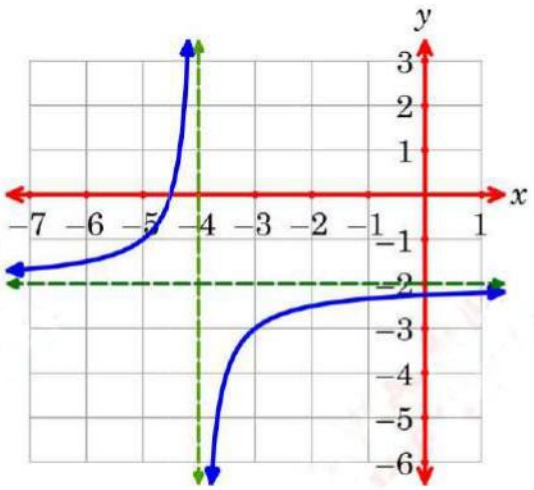
B



C



D



Q67 9.9

What are the asymptotes of the graph of the function:

$$f(x) = \frac{2}{x-1} + 2$$

A $x = -1, y = 2$

B $x = 1, y = 2$

C $x = 1, y = -2$

D $x = -1, y = -2$

10 **Reveal: Solve rational equations**
Example 2 Page 356

Q68 (10.1)

Solve the rational equation:

$$\frac{2m}{m-4} - \frac{m^2+7m+4}{3m^2-18m+24} = \frac{4m}{3m-6}$$

Student Work:

(A) $m = 4$ (B) $m = -1$ (C) $m = 1$ (D) No solution

Q69 (10.2)

Solve the rational equation:

$$\frac{3x}{x-4} - \frac{x^2-7x-4}{x^2-16} = \frac{5}{x+4}$$

Student Work:

(A) $x = -4$ (B) $x = 3$ (C) $x = -3$ (D) No solution

Q70 10.3

Solve the rational equation:

$$\frac{x}{2x-1}+\frac{3}{x+4}=\frac{21}{2x^2+7x-4}$$

Student Work:

A $x=2$ or $x=-12$	B $x=2$	C $x=-2$ or $x=12$	D No solution

Q71 10.4

Solve the rational equation:

$$\frac{2}{y-5}+\frac{y-1}{2y+1}=\frac{2}{2y^2-9y-5}$$

Student Work:

A $y=5$	B $y=-\frac{1}{2}$	C $y=2$	D No solution

Q72 (10.5)

Solve the rational equation:

$$\frac{x-8}{2x+2}+\frac{x}{2x+2}=\frac{2x-3}{x+1}$$

Student Work:

(A) $x=-1$ (B) $x=1$ (C) $x=3$ (D) No solution

Q73 (10.6)

Solve the rational equation:

$$\frac{12p+19}{p^2+7p+12}-\frac{3}{p+3}=\frac{5}{p+4}$$

Student Work:

(A) $p=2$ (B) $p=-3$ (C) $p=-4$ (D) No solution

Q74 (10.7)

Solve the rational equation:

$$\frac{2f}{f^2-4}+\frac{1}{f-2}=\frac{2}{f+2}$$

Student Work:

(A) $f=2$ (B) $f=-6$ (C) $f=6$ (D) No solution

Q75 (10.8)

Solve the rational equation:

$$\frac{8}{t^2-9}+\frac{4}{t+3}=1$$

Student Work:

(A) $t=5$ (B) $t=-3$ (C) $t=5$ or $t=-1$ (D) No solution

Q76 10.9

Solve the rational equation:

$$\frac{x}{x-2}+\frac{1}{x+3}=\frac{3}{2}$$

Student Work:

(A) $x=7$ and $x=-2$

(B) $x=3$ and $x=-1$

(C) $x=2$

(D) No solution

11 **Reveal: Classify and determine study types.**
Learn • Types of Studies Page 372

Types of Studies

In a survey, data are collected from responses given by members of a group regarding their characteristics, behaviors, or opinions.

In an experiment, the sample is divided into two randomly selected groups, the **experimental group** and the **control group**. The effect on the experimental group is then compared to the control group.

In an observational study, members of a sample are measured or observed without being affected by the study.

أنواع الدراسات

في الاستطلاع
تُجمع البيانات من الاستجابات التي يقدمها أفراد المجموعة حول خصائصهم أو سلوكياتهم أو آرائهم.

في التجربة
تُقسَم العينة إلى مجموعتين يتم اختيارهما عشوائيًا: **المجموعة التجريبية** و**المجموعة الضابطة**. ثم تتم مقارنة التأثير على المجموعة التجريبية بالمجموعة الضابطة.

في الدراسة المسحية
يتم قياس أفراد العينة أو ملاحظتهم دون أن يتأثروا بالدراسة.

Q77 (11.1)

Determine whether the situation describes a survey, an experiment, or an observational study:
An Internet service provider conducts an online study in which customers are randomly selected and asked to provide feedback on their customer service.

A) Survey
B) Experiment
C) Observational study
D) None of the above

Q78 (11.2)

Determine whether the situation describes a survey, an experiment, or an observational study:
A research group randomly selects 100 business owners, half of whom started their own businesses, and compares their success.

A) Observational study
B) Survey
C) Experiment
D) None of the above

Q79 11.3

Determine whether the situation describes a survey, an experiment, or an observational study:
A research group randomly chooses 50 people to participate in a study to determine whether exercising regularly reduces the risk of diabetes in adults.

(A) Experiment
(B) Survey
(C) Observational study
(D) None of the above

Q80 11.4

Determine whether the situation describes a survey, an experiment, or an observational study:
An online video streaming service mails a questionnaire to randomly selected people across the country to determine whether they prefer streaming movies or sports.

(A) Survey
(B) Experiment
(C) Observational study
(D) None of the above

Q81 11.5

Determine whether the situation describes a survey, an experiment, or an observational study:
A pizza shop owner wants to determine how satisfied his customers are with a new special that he has on the menu.

(A) Survey
(B) Experiment
(C) Observational study
(D) None of the above

Q82 11.6

A television network mails a questionnaire to randomly selected people across the country to determine whether they prefer watching sitcoms or dramas. What is the study type?

(A) survey
(B) an experiment
(C) observational study
(D) census

Q83 11.7

Which of the following is an observational study?

(A) A driving school wants to determine the main issue drivers face while taking the driving test. They watch and record 50 random people.
(B) A news organization wants to randomly call citizens to gauge opinions on a presidential election.
(C) A pharmaceutical company wants to test whether a new medicine is effective.
(D) A restaurant wants to conduct an online study in which they ask customers whether they were satisfied with their dining experience.

Q84 11.8

Which of the following is a survey?

(A) A driving school wants to determine the main issue drivers face while taking the driving test. They watch and record 50 random people.
(B) A news organization wants to randomly call citizens to gauge opinions on a presidential election.
(C) A pharmaceutical company wants to test whether a new medicine is effective.
(D) A gaming company plans to test whether a new controller is preferable. A group of teens will be observed while using the controller.

Q85 11.9

A group of high school students is randomly selected and asked to complete the form shown. This situation is:

(A) a survey

(B) an experiment

(C) an observational study

(D) a census

Do you agree with the new lunch rules?

☐ agree

☐ disagree

☐ don't care

Q86 11.10

Researchers give one group a new cold medicine and compare them to a group that takes no medicine. What is the group that is not given any medicine?

(A) the control group in an experiment

(B) the experimental group in an observational study

(C) the experimental group in an experiment

(D) the control group in an observational study

Q87 11.11

Which situation describes an experiment?

(A) A retro movie theater wants to determine what genre of movies to play. They plan to poll 50 random area residents.

(B) A driving school wants to determine the main issue drivers face. They watch and record 50 random people taking the test.

(C) An engineer is planning to test 50 metal samples to determine whether a new titanium alloy has a higher strength.

(D) A grocery store conducts a study in which customers are randomly selected and asked to provide feedback on their shopping experience.

Q88 11.12

Which situation describes an observational study?

(A) A driving school wants to determine the main issue drivers face. They watch and record 50 random people taking the test.

(B) A national pet chain wants to know whether customers would pay a small annual fee. They send questionnaires to 200 customers.

(C) A pharmaceutical company wants to test whether a new medicine is effective.

(D) Scientists study the behavior of one group of cats given a new heartburn treatment, and another group given a placebo.

Q89 11.13

Which situation describes a survey?

(A) A national pet chain wants to know whether customers would pay a small annual fee. They send questionnaires to 200 customers.

(B) A driving school wants to determine the main issue drivers face. They watch and record 50 random people taking the test.

(C) A research company wants to study users and non-users of full-fat dairy products to determine if non-use affects cholesterol levels.

(D) A pharmaceutical company wants to test whether a new medicine is effective.

Q90 11.14

The textbook committee conducts a study to determine whether students prefer digital or print textbooks. What is the study type?

(A) survey

(B) an experiment

(C) observational study

(D) census

12 **Reveal: Find and compare experimental and theoretical probabilities.**
Example 1 Page 379

Q91 (12.1)

A student tossed a fair eight-sided die 200 times and recorded the results in the table. Find the theoretical and experimental probability of rolling an 8:

Number on Die & Frequency

Number on Die	Frequency
1	28
2	19
3	24
4	22
5	21
6	18
7	26
8	42

(A) Theoretical: 12.5%, Experimental: 21.0%

(B) Theoretical: 12.5%, Experimental: 24.5%

(C) Theoretical: 14.0%, Experimental: 21.0%

(D) Theoretical: 12.5%, Experimental: 12.5%

Q92 (12.2)

A student tossed a fair die 150 times and recorded the results in the table. Find the theoretical and experimental probabilities of rolling a 5. Write your answer as a percentage rounded to the nearest tenth, if necessary:

Number & Frequency

Number	Frequency
1	51
2	16
3	23
4	19
5	24
6	17

(A) Theoretical: 16.7%, Experimental: 16.0%

(B) Theoretical: 20.0%, Experimental: 16.0%

(C) Theoretical: 16.7%, Experimental: 20.0%

(D) Theoretical: 16.0%, Experimental: 16.7%

Q93 (12.3)

A student spun a spinner with 4 equal sections 100 times and recorded the results in the table:
a. Find the theoretical probability of spinning blue.
b. Find the experimental probability of spinning blue.

Spinner Section & Frequency

Spinner Section	Frequency
Red	35
Blue	38
Green	13
Yellow	14

(A) Theoretical: 25%, Experimental: 38%

(B) Theoretical: 33%, Experimental: 25%

(C) Theoretical: 25%, Experimental: 35%

(D) Theoretical: 20%, Experimental: 33%

13 **Reveal: Design simulations to estimate probabilities.**
Exercises (7, 8) Page 384

Q94 **13.1**

Describe a spinner that could be used to simulate an event with 2 possible outcomes, one with a probability of 60%:

(A) Use a spinner with 2 regions. The one representing 60% and the one representing 40%.

(B) A spinner split into two equal halves of $180°$ each.

(C) A spinner with a $60°$ sector and a $300°$ sector.

(D) A spinner with 6 equal sections.

Q95 **13.2**

How should numbers be assigned to use a random number generator for the following situation?

- **Probability of choosing blue:** 40%
- **Probability of choosing green:** 20%
- **Probability of choosing red:** 30%
- **Probability of choosing purple:** 10%

(A) Blue: 1-40, Green: 41-60, Red: 61-90, Purple: 91-100

(B) Blue: 1-4, Green: 5-6, Red: 7-9, Purple: 0

(C) Both A and B are correct

(D) Blue: 1-40, Green: 1-20, Red: 1-30, Purple: 1-10

14 Reveal: Describe a data distribution by its center, spread, and overall shape. (No need for graphing calculator)

Example 1, Exercises (1, 2) Pages 388, 391

Q96 14.1

A coach recorded the times of each truck member for a 400-meter race. Find and interpret the standard deviation of the data:

400m Race Times (seconds)	
57.1	55.9
59.3	54.9
54.6	50.3
55.2	53.5

(A) Standard deviation ≈ 1.8 seconds; most times are within 1.8 seconds of the mean.

(B) Standard deviation ≈ 3.2 seconds; times vary widely.

(C) Standard deviation ≈ 0.8 seconds; times are highly clustered.

(D) Standard deviation ≈ 2.5 seconds.

Q97 14.2

The manager of a cafeteria tracked the number of waffles that were sold during breakfast every day.

Part A: The standard deviation is approximately . . . . . waffles.

Part B: The majority of the sales were between . . . . . and . . . . . waffles.

Number Sold	
36	42
48	40
44	56
57	53

(A) Part A: 9.3, Part B: 36.6 and 55.2

(B) Part A: 12.1, Part B: 30.0 and 50.0

(C) Part A: 8.5, Part B: 35.0 and 52.0

(D) Part A: 10.0, Part B: 36.0 and 56.0

Q98 (14.3)

A barber wants to purchase new professional shears from a Web site. The prices of all of the shears are shown in the table. Use the standard deviation formula to find and interpret the standard deviation of the data. Round your answers to the nearest cent.

Cost of Shears ($)			
50	165	55	79
84	68	38	42

(A) Standard deviation $\approx \$45.42$; prices differ from the mean price by an average of $\$45.42$.

(B) Standard deviation $\approx \$38.15$; prices differ from the mean price by an average of $\$38.15$.

(C) Standard deviation $\approx \$52.10$; prices vary greatly.

(D) Standard deviation $\approx \$28.50$; most shears cost near the average.

Q99 (14.4)

Ms. Sanchez keeps track of the total number of books each student in the book club reads during the school year. Use the standard deviation formula to find and interpret the standard deviation of the data. Round your answers to the nearest tenth.

Books Read		
9	6	12
8	9	14
10	13	8

(A) Standard deviation ≈ 2.6 books; the number of books read typically differs from the mean by about 2.6.

(B) Standard deviation ≈ 3.8 books; the data shows high variation.

(C) Standard deviation ≈ 1.5 books; most students read the same number of books.

(D) Standard deviation ≈ 4.2 books.

15 **Reveal: Draw and find angles in standard position.**
Example 3 Page 418

Q100 (15.1)

Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $45°$ angle:

(A) $405°$ and $-315°$
(B) $315°$ and $-405°$
(C) $225°$ and $-135°$
(D) $135°$ and $-225°$

Q101 (15.2)

Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $-50°$ angle:

(A) $310°$ and $-410°$
(B) $410°$ and $-310°$
(C) $130°$ and $-230°$
(D) $230°$ and $-130°$

Q102 (15.3)

Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $65°$ angle:

(A) $425°$ and $-295°$
(B) $295°$ and $-425°$
(C) $360°$ and $-65°$
(D) $245°$ and $-115°$

Q103 (15.4)

Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $-75°$ angle:

(A) $285°$ and $-435°$
(B) $435°$ and $-285°$
(C) $105°$ and $-255°$
(D) $180°$ and $-75°$

Q104 (15.5)

Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $230°$ angle:

(A) $590°$ and $-130°$
(B) $130°$ and $-590°$
(C) $410°$ and $-230°$
(D) $360°$ and $-130°$

Q105 (15.6)

Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $15°$ angle:

(A) $375°$ and $-345°$
(B) $345°$ and $-375°$
(C) $195°$ and $-165°$
(D) $515°$ and $-195°$

Q106 (15.7)

Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $60°$ angle:

(A) $420°$ and $-300°$
(B) $300°$ and $-420°$
(C) $240°$ and $-120°$
(D) $120°$ and $-240°$

Q107 (15.8)

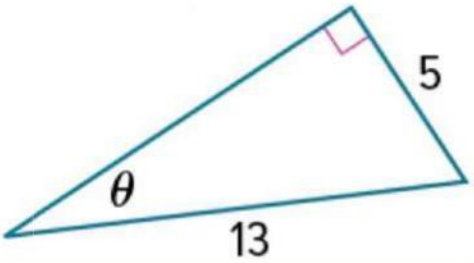
Find an angle with a positive measure and an angle with a negative measure that are coterminal with a $370°$ angle:

(A) $10°$ and $-350°$
(B) $730°$ and $-710°$
(C) Both A and B
(D) $710°$ and $-100°$

16 **Reveal: Find values of trigonometric ratios.**
Exercises (1-6) Page 431

Q108 16.1

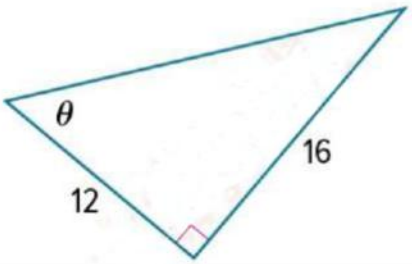
Find the exact value of $\sin\theta$ for the right triangle given in the figure:



(A) $\frac{5}{13}$ (B) $\frac{12}{13}$
(C) $\frac{5}{12}$ (D) $\frac{13}{5}$

Q109 16.2

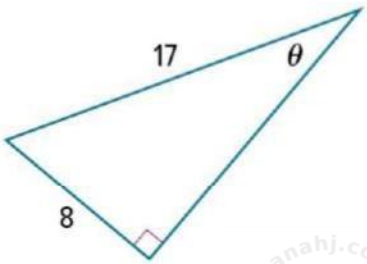
Find the exact value of $\cos\theta$ for the right triangle given in the figure:



(A) $\frac{12}{20}$ (B) $\frac{16}{20}$
(C) $\frac{12}{16}$ (D) $\frac{16}{12}$

Q110 16.3

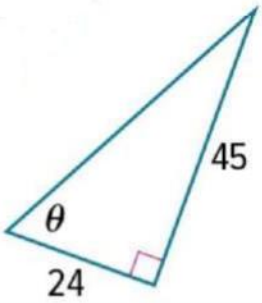
Find the exact value of $\tan\theta$ for the right triangle given in the figure:



(A) $\frac{8}{17}$ (B) $\frac{15}{17}$
(C) $\frac{8}{15}$ (D) $\frac{15}{8}$

Q111 16.4

Find the exact value of $\csc\theta$ for the right triangle given in the figure:



A $\frac{25}{24}$

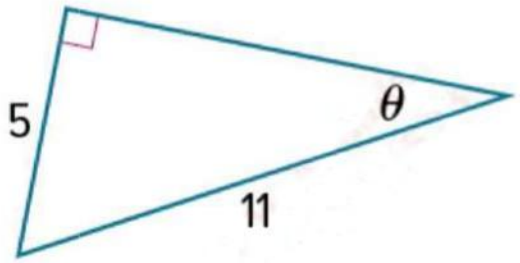
B $\frac{24}{25}$

C $\frac{7}{25}$

D $\frac{25}{7}$

Q112 16.5

Find the exact value of $\sec\theta$ for the right triangle given in the figure:



A $\frac{11}{5}$

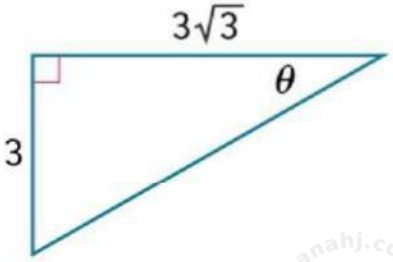
B $\frac{5}{11}$

C $\frac{\sqrt{96}}{11}$

D $\frac{11}{\sqrt{96}}$

Q113 16.6

Find the exact value of $\cot\theta$ for the right triangle given in the figure:



A $\sqrt{3}$

B $\frac{1}{\sqrt{3}}$

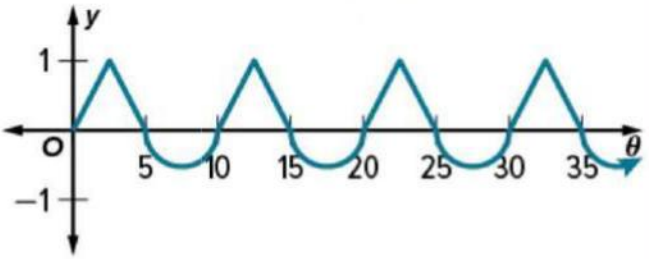
C $3\sqrt{3}$

D $\frac{\sqrt{3}}{3}$

17 **Reveal:** **Use the properties of periodic functions to evaluate trigonometric functions.**
Exercises (13-18) Page 441

Q114 **17.1**

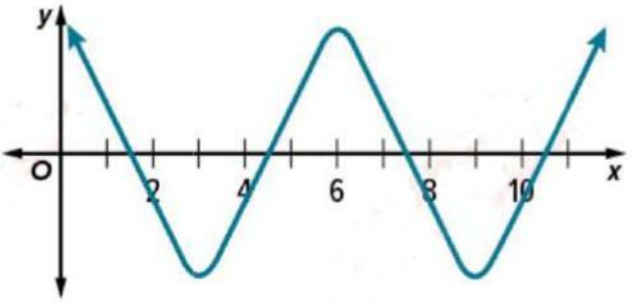
Determine the period of the function shown in the graph:



(A) 5
(B) 10
(C) 15
(D) 20

Q115 **17.2**

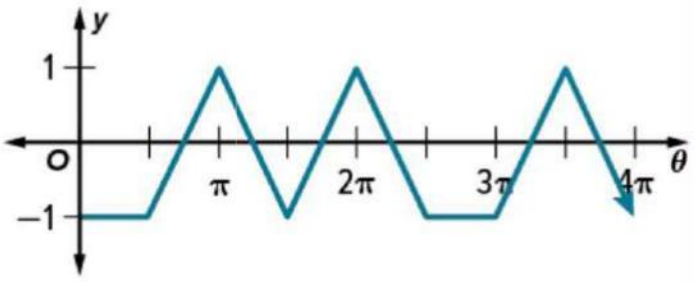
Determine the period of the function shown in the graph:



(A) 3
(B) 4
(C) 6
(D) 12

Q116 **17.3**

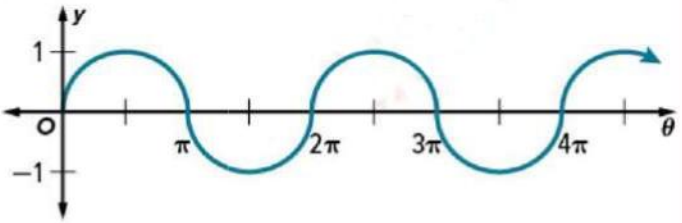
Determine the period of the function shown in the graph:



(A) π
(B) 2π
(C) $\frac{5\pi}{2}$
(D) 4π

Q117 (17.4)

Determine the period of the function shown in the graph:



(A) 2π

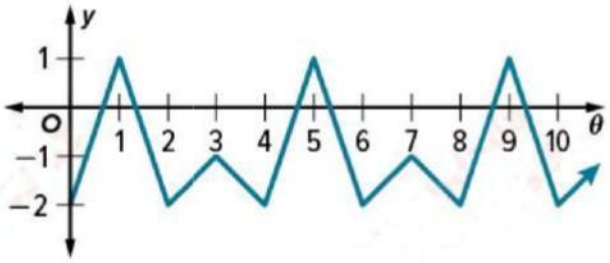
(B) π

(C) $\frac{\pi}{2}$

(D) 3π

Q118 (17.5)

Determine the period of the function shown in the graph:



(A) 2

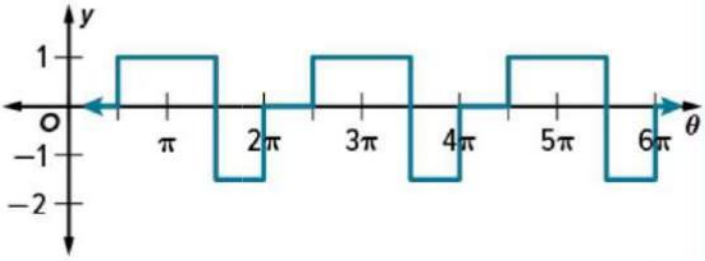
(B) 5

(C) 6

(D) 4

Q119 (17.6)

Determine the period of the function shown in the graph:



(A) 2π

(B) 3π

(C) 5π

(D) 4π

18 **Reveal: Use sinusoidal functions to solve problems.**
Example 6, 11 Pages 450, 479

Q120 (18.1)

The voltage supplied by an electrical outlet can be represented by a periodic function. The voltage oscillates between -120 and 120 volts, with a frequency of 50 cycles per second. Which function models this voltage v as a function of time t?

(A) $v = 120 \sin 100\pi t$

(B) $v = 120 \sin 50\pi t$

(C) $v = 50 \sin 120\pi t$

(D) $v = 120 \cos 100\pi t$

Q121 (18.2)

A spring oscillates with a frequency of 1 cycle per second. The distance between the maximum and minimum points of the oscillation is 3 centimeters. Which of these functions can be used to model the oscillation if y represents the distance in centimeters from the equilibrium position and t is given in seconds:

(A) $y = 1.5 \sin 2\pi t$

(B) $y = 1.5 \sin \pi t$

(C) $y = 3 \sin 2\pi t$

(D) $y = 3 \sin \pi t$

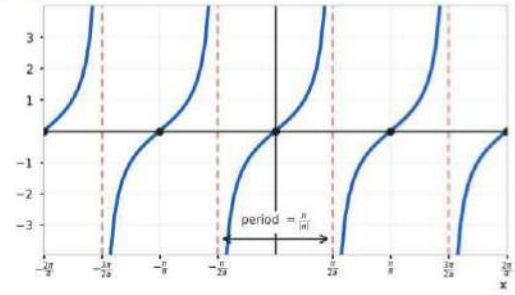
19 **Reveal: Describe and graph trigonometric functions other than sine, cosine, and tangent.**
Exercises (7-15) Page 461

Reciprocal & Tangent Trig Functions: $\tan ax$, $\cot ax$, $\csc ax$, $\sec ax$

a is a nonzero constant | $n \in \mathbb{Z}$ | graphs drawn for $a > 0$

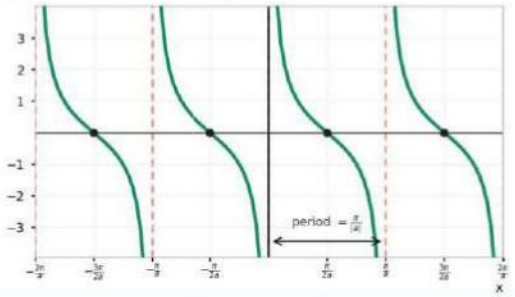
$y = \tan(ax)$

Period	$\frac{\pi}{\lvert a \rvert}$
Vertical asymptotes	$x = \frac{\pi}{2a} + \frac{n\pi}{a},\ n \in \mathbb{Z}$
Distance between 2 consecutive asymptotes	$\frac{\pi}{\lvert a \rvert}$ (equals the period)
x-intercepts	$x = \frac{n\pi}{a},\ n \in \mathbb{Z}$
Midline	centered on $y = 0$
Extrema	none



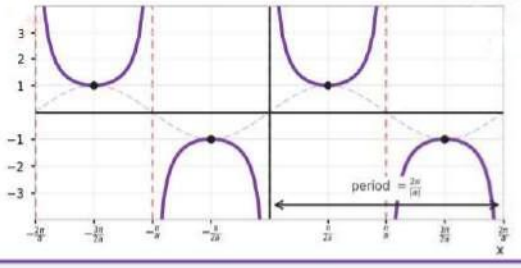
$y = \cot(ax)$

Period	$\frac{\pi}{\lvert a \rvert}$
Vertical asymptotes	$x = \frac{n\pi}{a},\ n \in \mathbb{Z}$
Distance between 2 consecutive asymptotes	$\frac{\pi}{\lvert a \rvert}$ (equals the period)
x-intercepts	$x = \frac{\pi}{2a} + \frac{n\pi}{a},\ n \in \mathbb{Z}$
Midline	centered on $y = 0$
Extrema	none



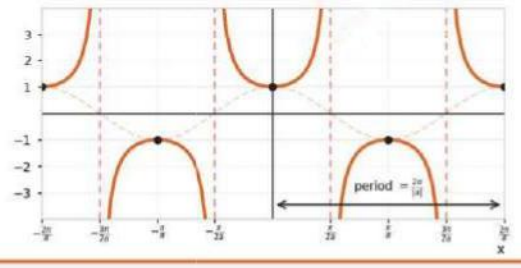
$y = \csc(ax)$

Period	$\frac{2\pi}{\lvert a \rvert}$
Vertical asymptotes	$x = \frac{n\pi}{a},\ n \in \mathbb{Z}$
Distance between 2 consecutive asymptotes	$\frac{\pi}{\lvert a \rvert}$ (half the period)
x-intercepts	none
Midline	$y = 0$ (midline of $\sin ax$)
Extrema	local min: $y = 1$ at $x = \frac{\pi}{2a} + \frac{2n\pi}{a}$ local max: $y = -1$ at $x = \frac{3\pi}{2a} + \frac{2n\pi}{a}$



$y = \sec(ax)$

Period	$\frac{2\pi}{\lvert a \rvert}$
Vertical asymptotes	$x = \frac{\pi}{2a} + \frac{n\pi}{a},\ n \in \mathbb{Z}$
Distance between 2 consecutive asymptotes	$\frac{\pi}{\lvert a \rvert}$ (half the period)
x-intercepts	none
Midline	$y = 0$ (midline of $\cos ax$)
Extrema	local min: $y = 1$ at $x = \frac{2n\pi}{a}$ local max: $y = -1$ at $x = \frac{(2n+1)\pi}{a}$



Q122 **19.1**

Which of the following functions has a period of $\frac{8\pi}{3}$?

(A) $y = \cot \frac{1}{2}x$ (B) $y = \csc 3x$ (C) $y = \sec \frac{1}{3}x$ (D) $y = \csc \frac{3}{4}x$

Q123 (19.2)

Which of the following functions has a period of $\frac{\pi}{2}$?

(A) $y = \cot \frac{1}{2}x$

(B) $y = \sec 2x$

(C) $y = \cot 2x$

(D) $y = \csc 3x$

Q124 (19.3)

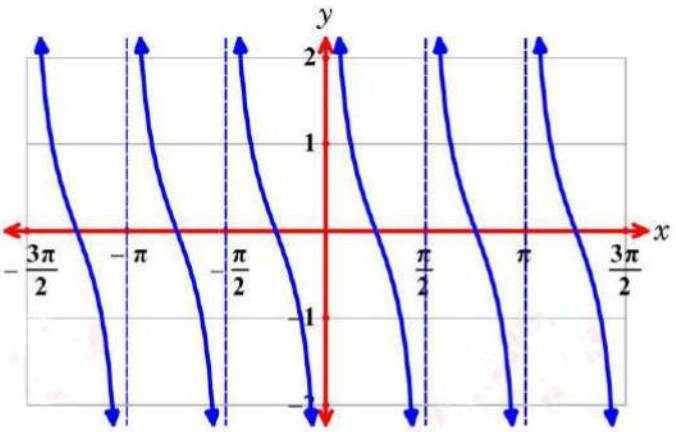
Which of the following functions matches the graph shown below?

(A) $y = \cot 2x$

(B) $y = -2 \cot x$

(C) $y = \csc 3x$

(D) $y = 3 \sec x$



Q125 (19.4)

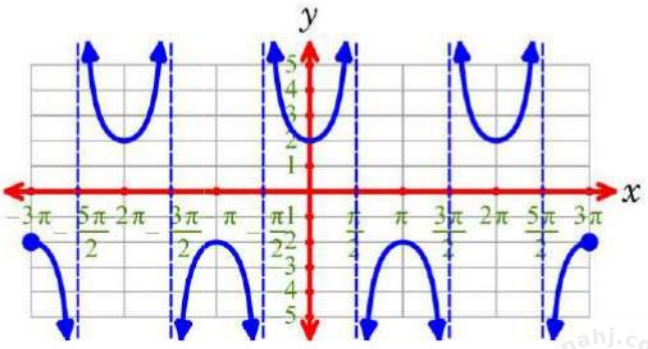
Which of the following functions matches the graph shown below?

(A) $y = \sec 2x$

(B) $y = 2 \sec x$

(C) $y = \frac{1}{2} \csc x$

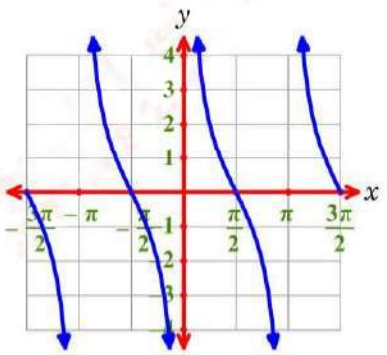
(D) $y = \sec \frac{1}{2}x$



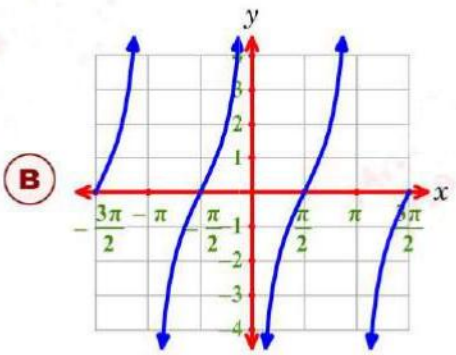
Q126 19.5

Select the correct graph for the function $y = -2\cot x$:

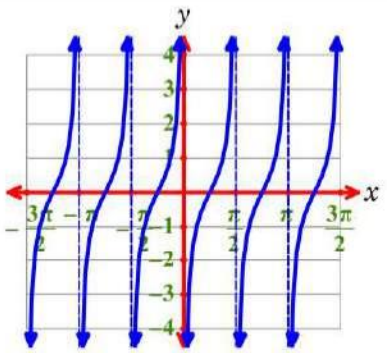
A



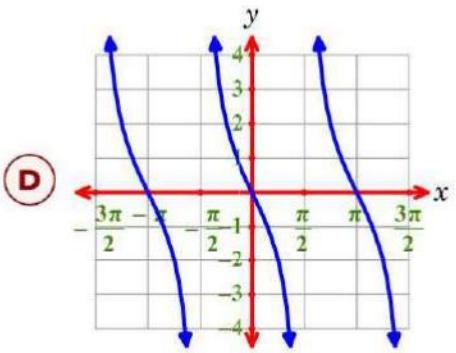
B



C



D



Q127 19.6

Find the period of the function $y = \csc 3x$:

A $\frac{3\pi}{2}$

B $\frac{2\pi}{3}$

C 3π

D 6π

Q128 19.7

Find the period of the function $y = \csc \frac{1}{2}x$ and the distance between consecutive vertical asymptotes:

A Period is 4π, and distance between vertical asymptotes is 2π

B Period is 2π, and distance between vertical asymptotes is 2π

C Period is 4π, and distance between vertical asymptotes is 4π

D Period is π, and distance between vertical asymptotes is π

Q129 (19.8)

Find the period of the function $y = \sec \frac{3}{2}x$ and the distance between consecutive vertical asymptotes:

(A) Period is 2π, and distance between vertical asymptotes is π

(B) Period is $\frac{2\pi}{3}$, and distance between vertical asymptotes is $\frac{2\pi}{3}$

(C) Period is $\frac{4\pi}{3}$, and distance between vertical asymptotes is $\frac{4\pi}{3}$

(D) Period is $\frac{4\pi}{3}$, and distance between vertical asymptotes is $\frac{2\pi}{3}$

Q130 (19.9)

Find the period of the function $y = \sec \frac{1}{3}x$:

(A) 6π

(B) 3π

(C) $\frac{2\pi}{3}$

(D) 2π

Q131 (19.10)

Which of the following statements is true regarding the functions $y = \frac{1}{2}\csc x$ and $y = 3\sec x$?

(A) Both functions have the same period, which is 2π

(B) Both functions have the same amplitude, which is 3

(C) The period of $y = 3\sec x$ is four times the period of $y = \frac{1}{2}\csc x$

(D) Neither function has a defined period

20 **Reveal: Find values of angle measures by using inverse trigonometric functions.**
Exercises (1-9) Page 475

Q132 (20.1)

Find the exact value of $\text{Cos}^{-1}\left(\frac{\sqrt{3}}{2}\right)$ **in radians:**

(A) $\frac{\pi}{6}$	(B) $\frac{\pi}{3}$	(C) $\frac{\pi}{4}$	(D) $\frac{\pi}{2}$

Q133 (20.2)

Find the exact value of $\text{Sin}^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ **in radians:**

(A) $-\frac{\pi}{3}$	(B) $-\frac{\pi}{6}$	(C) $\frac{\pi}{3}$	(D) $\frac{\pi}{6}$

Q134 (20.3)

Find the exact value of $\text{Arccos}\left(-\frac{1}{2}\right)$ **in radians:**

(A) $\frac{2\pi}{3}$	(B) $\frac{\pi}{3}$	(C) $\frac{5\pi}{6}$	(D) $\frac{3\pi}{4}$

Q135 (20.4)

Find the exact value of $\text{Arctan}\sqrt{3}$ **in radians:**

(A) $\frac{\pi}{3}$	(B) $\frac{\pi}{6}$	(C) $\frac{\pi}{4}$	(D) $\frac{2\pi}{3}$

Q136 (20.5)

Find the exact value of $\text{Arccos}\left(-\frac{\sqrt{2}}{2}\right)$ **in radians:**

(A) $\frac{3\pi}{4}$	(B) $\frac{\pi}{4}$	(C) $\frac{5\pi}{4}$	(D) $-\frac{\pi}{4}$

Q137 (20.6)

Find the exact value of $\mathrm{Tan}^{-1}(-1)$ in radians:

(A) $-\frac{\pi}{4}$	(B) $\frac{3\pi}{4}$	(C) $-\frac{\pi}{3}$	(D) $\frac{\pi}{4}$

Q138 (20.7)

Find the exact value of $\mathrm{Sin}^{-1}\left(\frac{\sqrt{2}}{2}\right)$ in radians:

(A) $\frac{\pi}{4}$	(B) $\frac{\pi}{3}$	(C) $\frac{3\pi}{4}$	(D) $-\frac{\pi}{4}$

Q139 (20.8)

Find the exact value of $\mathrm{Cos}^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ in radians:

(A) $\frac{5\pi}{6}$	(B) $\frac{2\pi}{3}$	(C) $\frac{\pi}{6}$	(D) $-\frac{\pi}{6}$

Q140 (20.9)

Find the exact value of $\mathrm{Arcsin}\,1$ in radians:

(A) $\frac{\pi}{2}$	(B) π	(C) 0	(D) 2π

PART 2 FREE RESPONSE QUESTIONS

21 **Reveal:** Evaluate expressions involving the natural base and natural logarithm.
Exercises (10-12) Page 237

Q141 (21.1)

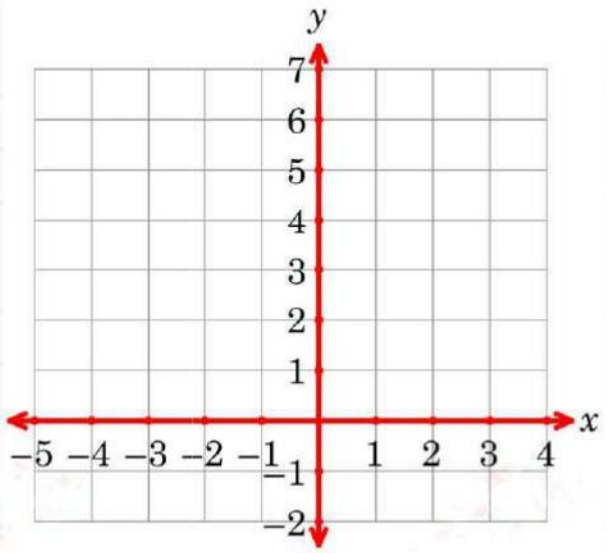
Consider the function $f(x) = 3e^{x-1} + 2$.

a. Graph the function.

b. Determine domain and range.

c. Find the average rate of change over the interval $[-5, -2]$.

Student Work:



Q142 (21.2)

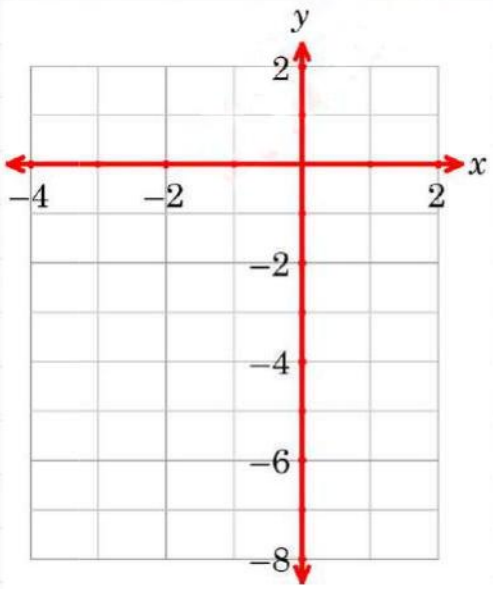
Consider the function $f(x) = -4e^{2x} - 1$.

a. Graph the function.

b. Determine domain and range.

c. Find the average rate of change over the interval $[-3, -1]$.

Student Work:



Q143 (21.3)

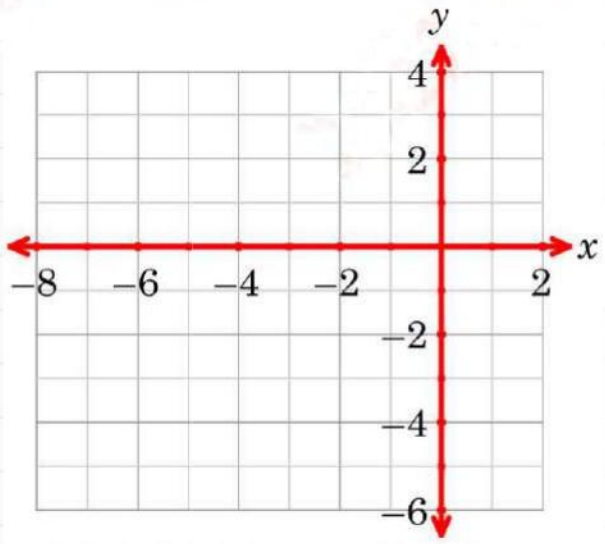
Consider the function $f(x) = -2e^{x+3} + 2$.

a. Graph the function.

b. Determine domain and range.

c. Find the average rate of change over the interval $[-7, -4]$.

Student Work:



22 **Reveal:** Use logarithms to solve problems involving exponential growth and decay.
Example 2 Page 297

Q144 22.1

The half-life of a radioactive substance is the time it takes for half of the atoms of the substance to disintegrate. The radioactive substance Thorium-230 is used to determine the ages of cave formations and coral. The half-life of Thorium-230 is $75,381$ years.

Part A: Determine the value of k and the equation of decay for Thorium-230.

Part B: How much of a 2-gram sample of Thorium-230 should be left after 1500 years?

Student Work:

Q145 (22.2)

Iodine-131, a radioactive isotope commonly used to treat thyroid cancer, has a half-life of 8.02 days.

Part A: Write the continuous exponential decay equation for Iodine-131. Round the value of k to the nearest thousandth.

Part B: How much of a 15-gram sample will be left after 20 days? Round to the nearest tenth if necessary.

Student Work:

Q146 (22.3)

In 2000, the world population was estimated to be 6.124 billion people. In 2005, it was 6.515 billion.

a. Write an exponential growth equation to represent the population y in billions t years after 2000.

b. Use the equation to predict the year in which the world population reached 7.5 billion people.

Student Work:

23 **Reveal:** Graph rational functions with oblique asymptotes and point discontinuity.
Example 4 Page 341

Q147 23.1

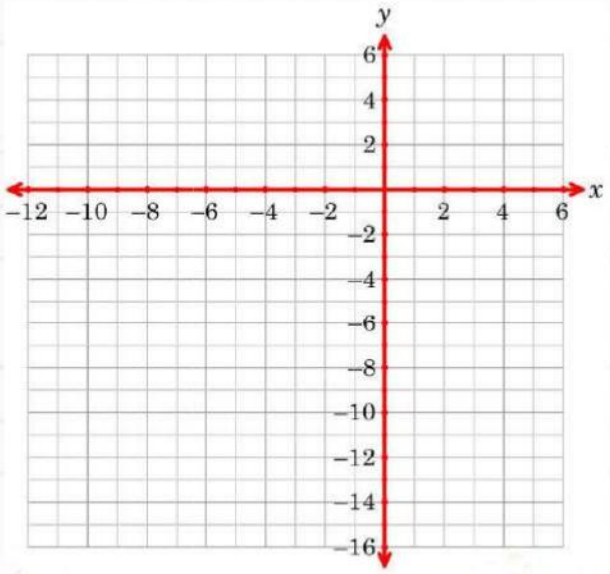
Consider $f(x) = \dfrac{x^2 + 2x + 1}{x + 4}$.

Part A: Find the zeros.

Part B: Find the asymptotes.

Part C: Graph $f(x) = \dfrac{x^2 + 2x + 1}{x + 4}$.

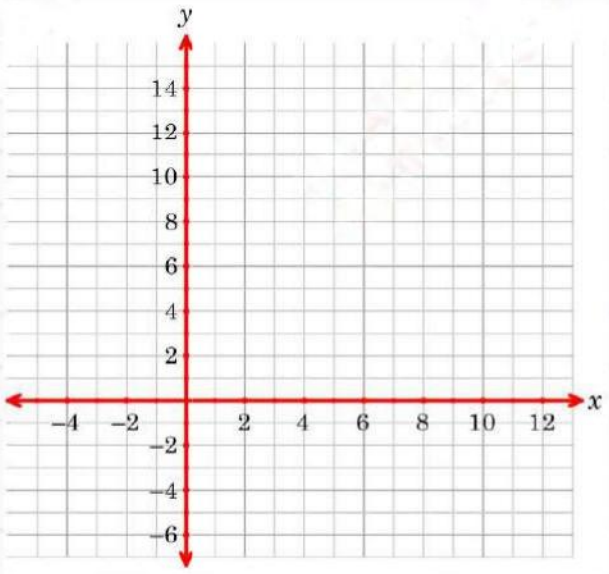
Student Work:



Q148 (23.2)

Find the zeros and asymptotes of the function $f(x) = \dfrac{x^2 + x}{x - 2}$. Then graph the function.

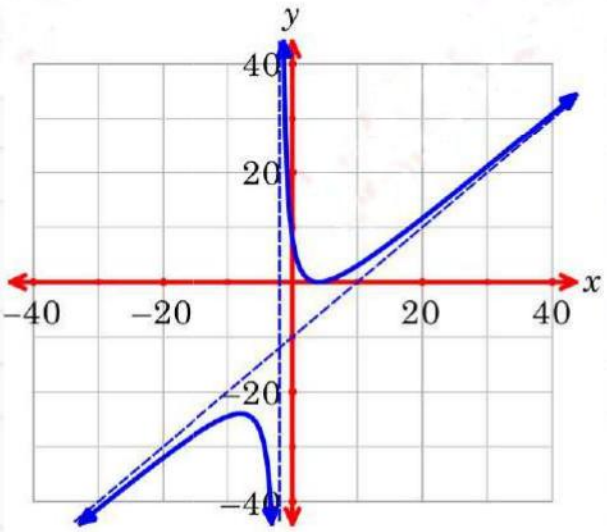
Student Work:



Q149 (23.3)

Find the zeros and asymptotes of the function $f(x) = \dfrac{(x-4)^2}{x+2}$. Then graph the function.

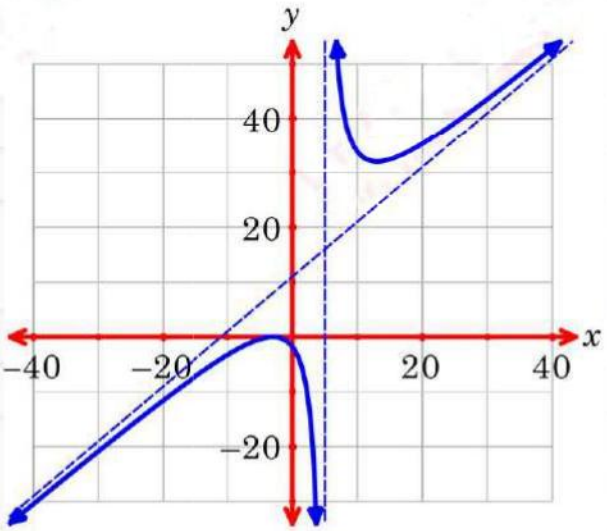
Student Work:



Q150 (23.4)

Find the zeros and asymptotes of the function $f(x) = \dfrac{(x+3)^2}{x-5}$. Then graph the function.

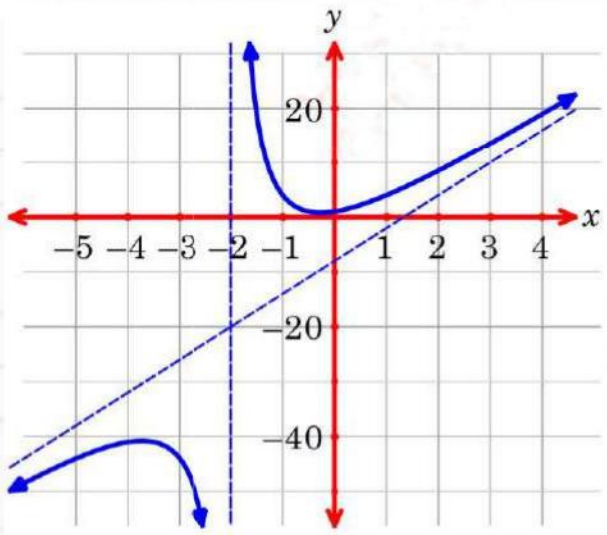
Student Work:



Q151 (23.5)

Find the zeros and asymptotes of the function $f(x) = \dfrac{6x^2+4x+2}{x+2}$. Then graph the function.

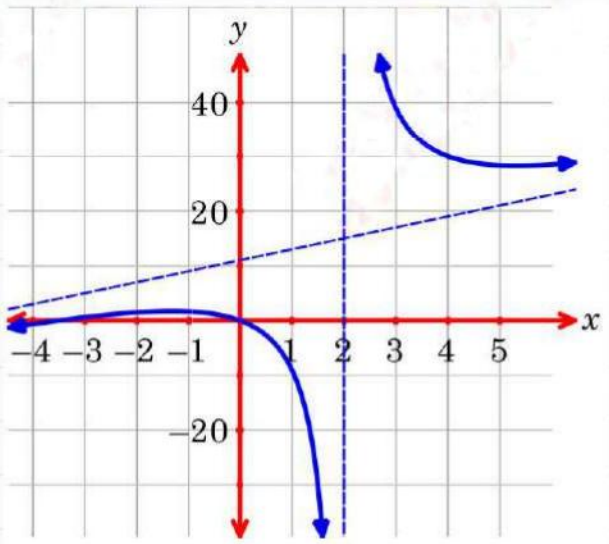
Student Work:



Q152 23.6

Find the zeros and asymptotes of the function $f(x) = \dfrac{2x^2 + 7x}{x - 2}$. Then graph the function.

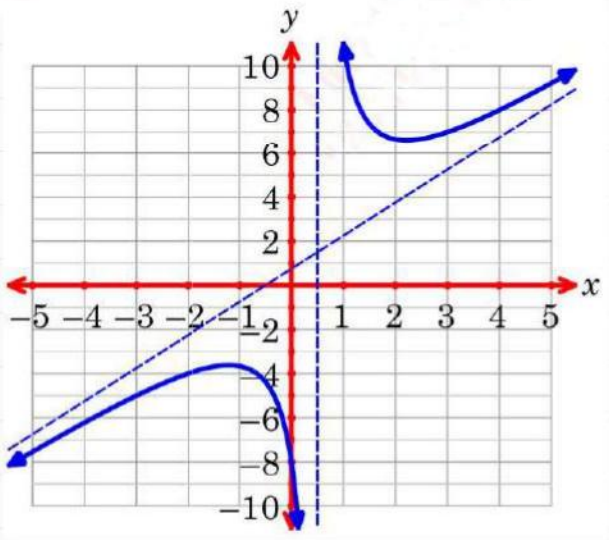
Student Work:



Q153 23.7

Find the zeros and asymptotes of the function $f(x) = \dfrac{3x^2 + 8}{2x - 1}$. Then graph the function.

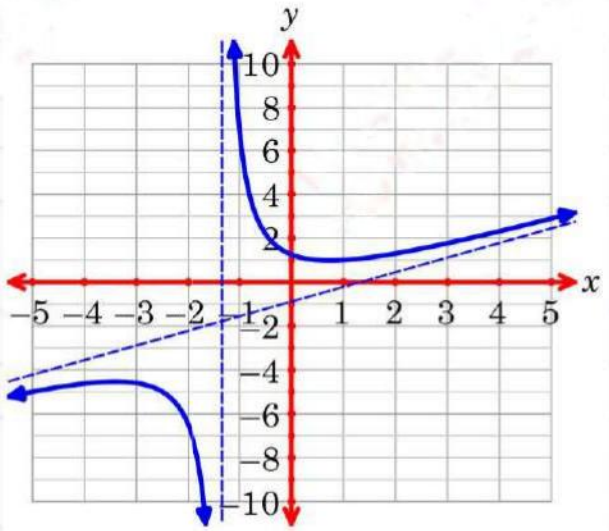
Student Work:



Q154 (23.8)

Find the zeros and asymptotes of the function $f(x) = \dfrac{2x^2 + 5}{3x + 4}$. Then graph the function.

Student Work:

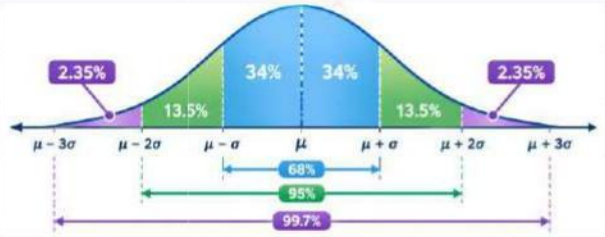


24 **Reveal:** (a) Find the area under normal distribution curves.
(b) Find probabilities for normal distributions and find data values given probabilities.
Example 5 Pages 397, Exercise 14 Pages 402

Q155 **24.1**

A normal distribution has a mean of 42 and a standard deviation of 6.
a. Find the range of values that represents the middle 95% of the distribution.
b. What percent of the data will be greater than 36?

Student Work:



Q156 **24.2**

The number of daily hits to a local news Web site is normally distributed with $\mu = 98,452$ hits and $\sigma = 10,325$ hits. Find the probability that the Web site will get at least $100,000$ hits on a given day, $P(X \geq 100,000)$.



$Z < a$

Z Value	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	[illegible]									
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133

Student Work:

Q157 (24.3)

The scores on a test administered to prospective employees are normally distributed with a mean of 100 and a standard deviation of 12.5.

a. What percent of the scores are between 70 and 80?

b. What percent of the scores are over 115?

c. If 800 people took the test, how many would you expect to score lower than 85?

Student Work:

$Z < a$

Z Value	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823

Q158 (24.4)

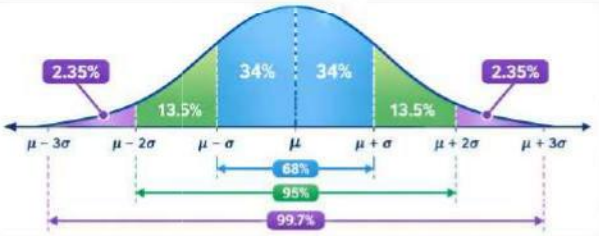
A normal distribution has a mean of 186.4 and a standard deviation of 48.9.

a. What range of values represents the middle 99.7% of the data?

b. What percent of data will be greater than 235.3?

c. What range of values represents the upper 2.5% of the data?

Student Work:



25 **Reveal:** (a) Convert between degrees and radian measures and find arc lengths by using central angles.
(b) Graph horizontal translations of trigonometric functions. (No need for graphing calculator)
Example 6 Pages 420, Exercises (52, 53) Pages 422, Exercises (7-12) Pages 469

Q159 (25.1)

A traffic circle, or roundabout, is a circular roadway at the intersection of two or more streets that allows cars to travel through more continuously than a traffic light or stop sign. The diameter of a traffic circle is 100 feet. How far does a car travel in the roundabout if it goes three-fourths of the way around?

Student Work:

Q160 (25.2)

If a surveyor's wheel with a radius of 15 inches completes $\frac{13}{20}$ of a rotation, what is the total distance traveled in feet? Round to the nearest hundredth if necessary.

Student Work:

Q161 (25.3)

A traffic roundabout has a diameter of 200 meters. How far does an automobile travel in the roundabout if it goes one-fourth of the way around?

Student Work:

Q162 (25.4)

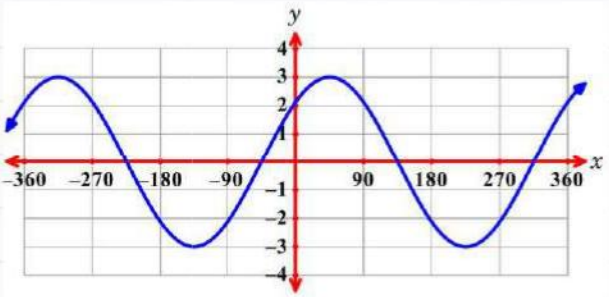
The length of the minute hand of an analog clock is 5 inches. If the minute hand rotates from 12 noon to $12:10$ PM, then how far does its point move?

Student Work:

Q163 (25.5)

State the amplitude, period, and phase shift for $y = 3\cos(\theta - 45°)$. Then graph the function and state the domain and range.

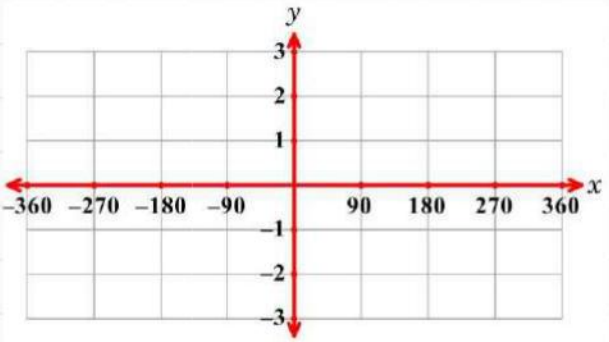
Student Work:



Q164 (25.6)

State the amplitude, period, and phase shift for $y = 2\sin(\theta + 60°)$. Then graph the function and state the domain and range.

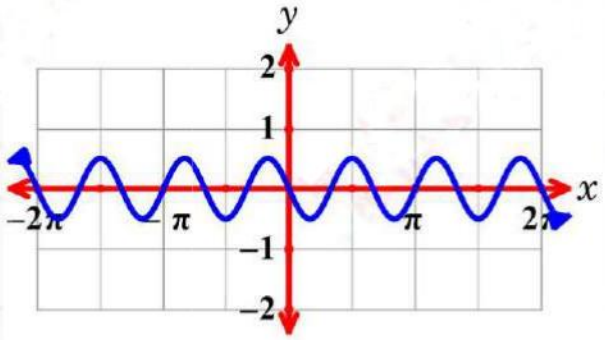
Student Work:



Q165 (25.7)

State the amplitude, period, and phase shift for $y = \frac{1}{2}\sin 3\left(\theta - \frac{\pi}{3}\right)$. Then graph the function and state the domain and range.

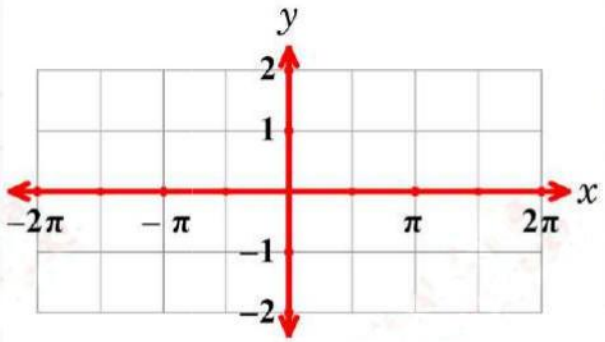
Student Work:



Q166 (25.8)

State the amplitude, period, and phase shift for $y = \frac{1}{2}\cos 3\left(\theta - \frac{\pi}{2}\right)$. Then graph the function and state the domain and range.

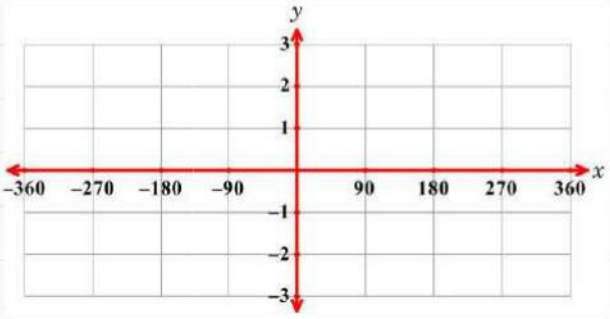
Student Work:



Q167 (25.9)

State the amplitude, period, and phase shift for $y = 2\cos(\theta + 90°)$. Then graph the function and state the domain and range.

Student Work:



Q168 25.10

State the amplitude, period, and phase shift for $y = \frac{1}{4}\sin(\theta - 30°)$. Then graph the function and state the domain and range.

Student Work:

