أوراق عمل مراجعة الوحدتين الرابعة والسادسة منهج ريفيل

Mathematics

Grade 12 General

Term two -2025/2026

Modules:

1- Module (4) : Inverse and Radical Functions.

2- Module (6) : Logarithmic Functions

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DONE BY

T. Mohd Rashed ALZZEN

وزارة التربية والتعليم لدولة الامارات العربية المتحدة

مدرسة الحصن للتعليم الثانوي

Mathematics, Grade 12 General

Module 4

Inverse and Radical Functions

ملاحظة: الكتاب المدرسي مرجع أساسي للطالب

2025-2026

إعداد: أ. محمد راشد الزّن

من المهارة إلى الصدارة
نحو مستقبل تصنعه المهارات

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❖ **Example (1):** If $f(x) = -x^2 + 3x + 1$, $g(x) = 2x^2 - 5x + 4$, Find each function.

1) $(f + g)(x) =$

2) $(f - g)(x) =$

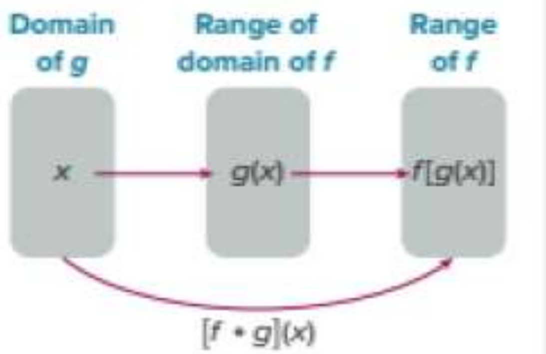
3) $(2f - 3g)(x) =$

❖ **Example (2):** If $f(x) = x^2 - 1$, $g(x) = x + 1$, Find each function.

1) $(f . g)(x) =$

2) $(\frac{f}{g})(x) =$

- **Compositions of Functions** :
- Key Concept: Suppose f and g are functions such that the range of g is a subset of the domain of f. Then the composition function (f**o**g)(x) can be described by
  [fog](x) = f[g(x)].



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❖ **Example (3):** Given f *and* $g(x)$, find $[\boldsymbol{f}o\boldsymbol{g}](x)$ *and* $[\boldsymbol{g}o\boldsymbol{f}](x)$, State the domain and range for each .

$f = \{(1,12), (10,11), (0\ ,13), (9,7)\}$. $g = \{(4,1), (5,0), (0\ , (13\ ,9), (12\ ,10)\}$

$a)$ $[\boldsymbol{f}o\boldsymbol{g}](x) =$

$b)$ $[\boldsymbol{g}o\boldsymbol{f}](x) =$

❖ **Example (4):** Given f *and* $g(x)$, find $[\boldsymbol{f}o\boldsymbol{g}](x)$ *and* $[\boldsymbol{g}o\boldsymbol{f}](x)$, State the domain and range for each .

$f = \{(5,13), (-4,-2), (-8\ ,-11), (3,1)\}$. $g = \{(-8,2), (-4,1), (3,-3), (5\ ,7)\}$

$a)$ $[\boldsymbol{f}o\boldsymbol{g}](x) =$

$b)$ $[\boldsymbol{g}o\boldsymbol{f}](x) =$

❖ **Example (5):** Given f *and* $g(x)$, find $[\boldsymbol{f}o\boldsymbol{g}](x)$ *and* $[\boldsymbol{g}o\boldsymbol{f}](x)$, State the domain and range for each .

$f = \{(-7,0), (4,5), (8\ ,12), (-3,6)\}$. $g = \{(6,8), (-12,-5), (0,5), (5\ ,1)\}$

$a)$ $[\boldsymbol{f}o\boldsymbol{g}](x) =$

$b)$ $[\boldsymbol{g}o\boldsymbol{f}](x) =$

❖ **Example (6):** Given $f(x) = 2x - 5$, $g(x) = 3x$, find $[\boldsymbol{f}o\boldsymbol{g}](x)$ *and* $[\boldsymbol{g}o\boldsymbol{f}](x)$, State the domain and range for each .

$a)$ $[\boldsymbol{f}o\boldsymbol{g}](x) =$

$b)$ $[\boldsymbol{g}o\boldsymbol{f}](x) =$

❖ **Example (7):** Given $f(x) = -3x$, $g(x) = -x + 8$, find $[\boldsymbol{f} o \boldsymbol{g}](x)$ and $[\boldsymbol{g} o \boldsymbol{f}](x)$, State the domain and range for each .

$a)$ $[\boldsymbol{f} o \boldsymbol{g}](x) =$

$b)$ $[\boldsymbol{g} o \boldsymbol{f}](x) =$

❖ **Example (8):** If $f(x) = 3x$, $g(x) = x + 4$, $h(x) = x^2 - 1$ Find each Value .

1) $f(g(1)) =$ 2) $g(h(0)) =$

3) $f(h(8)) =$ 4) $f(g(7)) =$

5) $(fog)(2) =$ 6) $(hof)(10) =$

❖ **Example (9):** A coach is ordering custom practice T-shirts and game jerseys for each of the team members. The coach orders T-shirts from a local shop that charges $7.50 for each, plus a $35 initial printer fee. The cost of the T-shirts is modeled by t(x) = 7.5x + 35, where x is the number of team members. He orders jerseys online, which cost $18 each with $20 shipping. The cost of the jerseys is modeled by j(x) = 18x + 20. Define and graph the function that represents the total cost of the T-shirts and jerseys. Identify and write a new function to represent total cost

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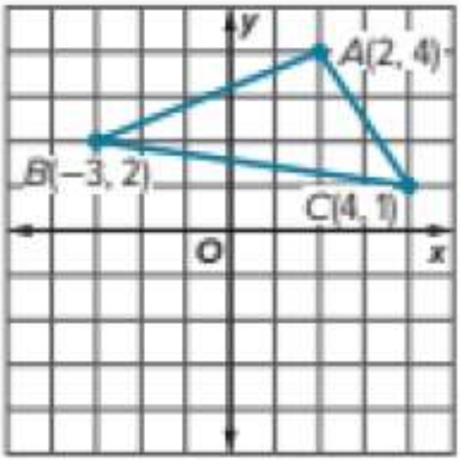
Key Concepts. Inverse Functions.

Words: If f and f^{-1} are inverses, then f(a) = b if and only if $f^{-1}(b) = a$.

❖ **Example (1):** The vertices of △ABC can be represented by the relation {(2, 4), (-3, 2), (4, 1)}. Find the inverse of the relation. Graph both the original relation and its inverse.



❖ **Example (2):** Find the inverse of each function , Then graph the function and its inverse .

a) $f(x) = 3x + 2$

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

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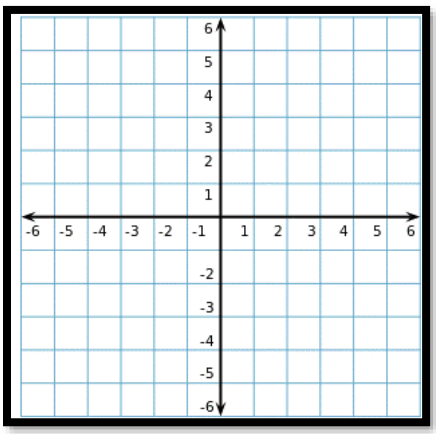
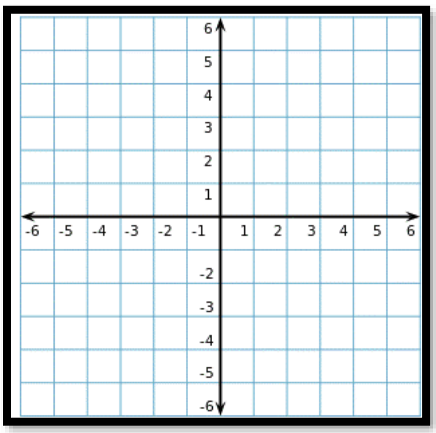
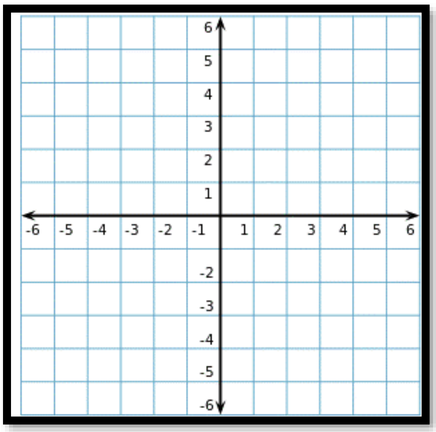
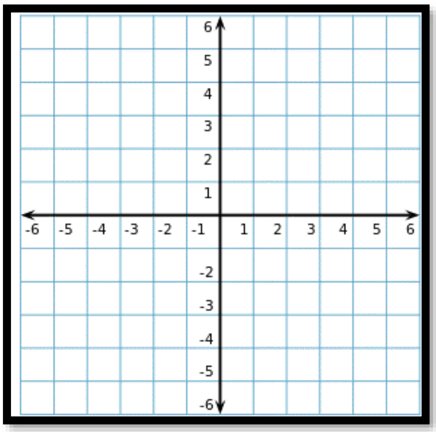




c) $f(x) = -8x + 9$

d) $f(x) = x^2 + 4$





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❖ **Example (3):** Determine whether each pair of functions are inverse functions.

$a)$ $f(x) = x - 1$, $g(x) = 1 - x$

$b)$ $f(x) = 2x + 3$, $g(x) = \frac{1}{2}(x - 3)$

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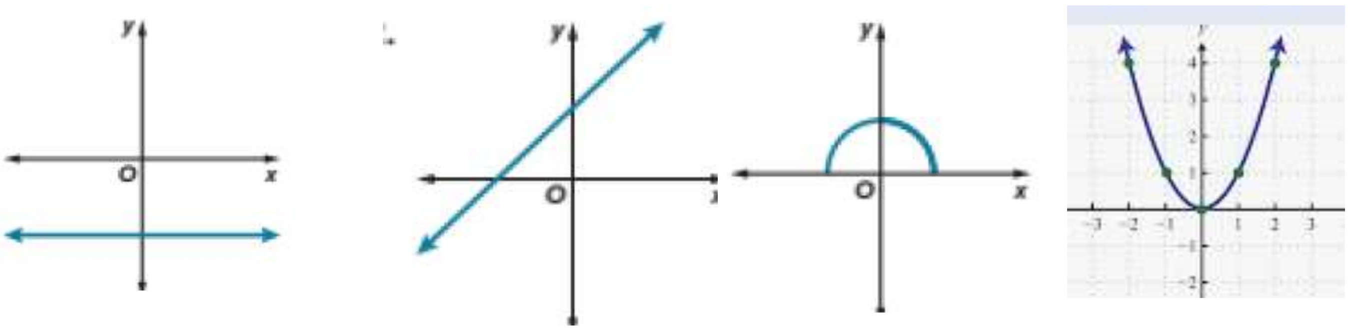
$c) \quad f(x) = (x+6)^2 \quad , \quad g(x) = \sqrt{x} - 6$

$d) \quad h(x) = \sqrt{x+13} \quad , \quad k(x) = (x-13)^2$

❖ **Example (4):** State whether the inverse is a functions.



Example (5): Restrict the domain of **f(x)** so that its inverse is also a function. State the restricted domain of **f(x)** and the domain of f^{-1}(x).

$a) \quad f(x) = x^2 + 5$

$b) \quad f(x) = \sqrt{x+3}$

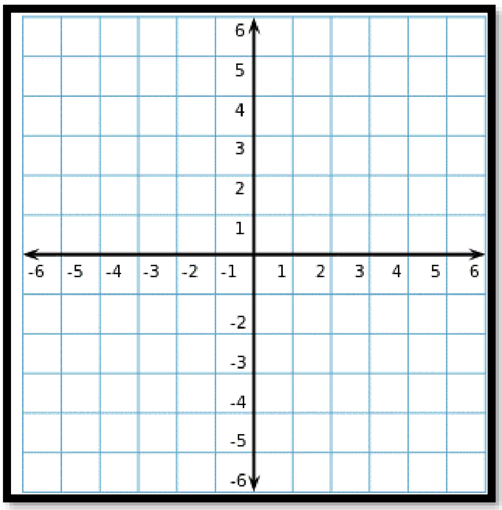
- A square root function can be written in the form $f(x) = \pm a\sqrt{x \pm h} \pm k$
- Each constant in the equation affects the parent graph.

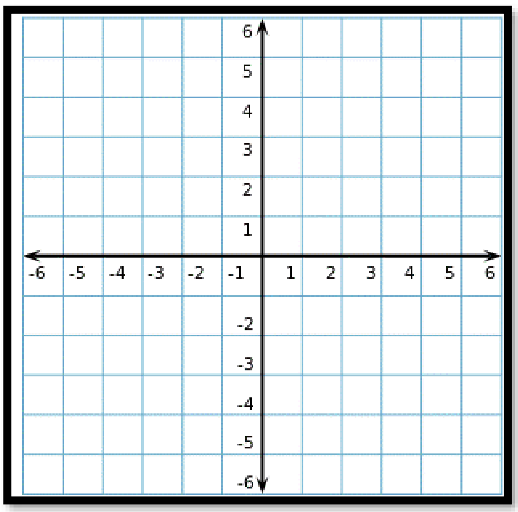
1) The value of $|a|$ **stretches** or **compresses** (dilates) the parent graph.
2) When the value of **a** is negative, the graph is reflected in **the x-axis**.
3) The value of **h** shifts (translates) the parent graph **left** or **right**.
4) The value of **k** shifts (translates) the parent graph **up** or **down**.

Example (1): Identify the **domain** and **range** (maximum or minimum domain and range) and **end behavior** of each square root function, and describe the transformations . Then sketch the graph.

a) $f(x) = \sqrt{x}$

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





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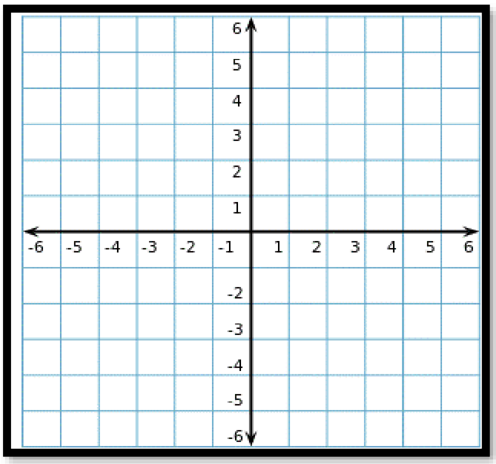
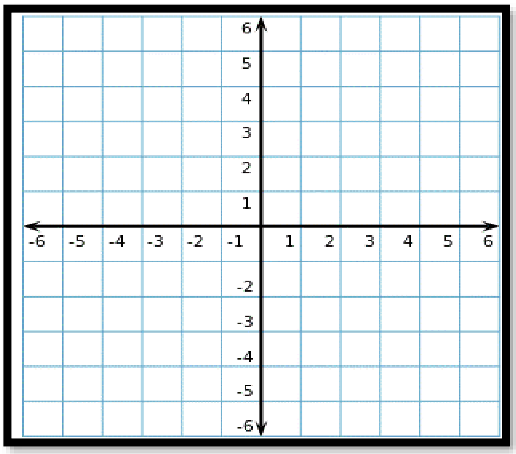
$c)\ f(x) = -2\sqrt{x+3} + 4$

$d)\ f(x) = \sqrt{2x+2} - 3$

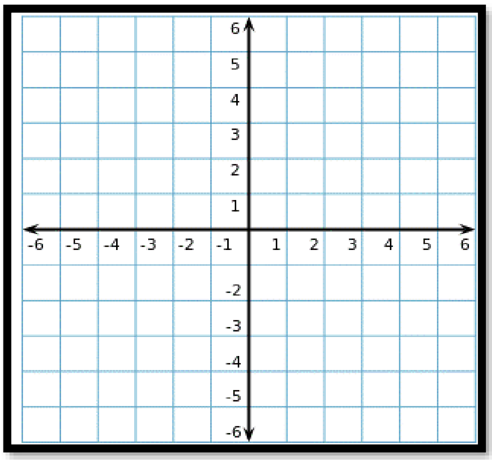


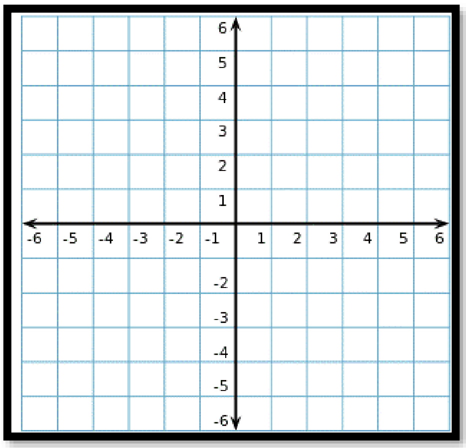


Example (2): Graph each function .

$a)\ y = \sqrt[3]{x-2} + 1$

$b)\ y = \sqrt[4]{x+3} - 5$

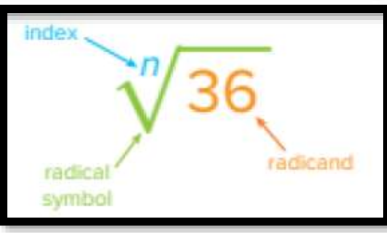




Key Concept • Real *n*th Roots

Suppose n is an integer greater than 1, a is a real number, and a is an nth root of b.

a	n is even.	n is odd.
$a > 0$	1 unique positive and 1 unique negative real root: $\pm\sqrt[n]{a}$	1 unique positive and 0 negative real root: $\sqrt[n]{a}$
$a < 0$	0 real roots	0 positive and 1 negative real root: $\sqrt[n]{a}$
$a = 0$	1 real root: $\sqrt[n]{0} = 0$	1 real root: $\sqrt[n]{0} = 0$



Example (1): Simplify .

$a)\quad \pm\sqrt{25x^4} =$

$b)\quad -\sqrt{(y^2+7)^{12}} =$

$c)\quad \sqrt{-289c^8d^4} =$

$d)\quad \sqrt[3]{343a^{18}b^6} =$

$e)\quad \pm\sqrt{121x^4y^{16}} =$

$f)\quad \sqrt{400x^{32}y^{40}} =$

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$g)\quad \sqrt{-81c^4d^8} =$

$h)\quad \sqrt[4]{16(x-3)^{16}} =$

Example (2): Simplify .

$a)\quad \sqrt[4]{81x^4} =$

$b)\quad \sqrt[8]{256(x-2)^{24}} =$

$c)\quad \sqrt{25c^{10}d^{12}} =$

$d)\quad \sqrt[6]{a^{18}b^6} =$

$e)\quad \sqrt[4]{81(x+4)^{12}} =$

$f)\quad \sqrt[5]{-32a^{15}b^{20}} =$

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- Key Concept: **Rational Exponents.**

  For any nonzero number b and any intergers x and y , with $y > 1$,

  $b^{\frac{x}{y}} = \sqrt[y]{b^x} = (\sqrt[y]{b})^{x}$, except when $b < 0$, and y is even . when $b < 0$, and y is even , a complex root may exist .

Example (1): Write each expression in radical form .

$\boldsymbol{a})$ $\boldsymbol{x^{\frac{4}{3}}} =$

$\boldsymbol{b})$ $\mathbf{8^{\frac{1}{5}}} =$

$\boldsymbol{c})$ $\mathbf{256^{\frac{1}{4}}} =$

$\boldsymbol{d})$ $\boldsymbol{y^{-\frac{5}{4}}} =$

$\boldsymbol{e})$ $\mathbf{81^{-\frac{1}{4}}} =$

$\boldsymbol{f})$ $\mathbf{16^{-\frac{5}{4}}} =$

$\boldsymbol{g})$ $(x^3)^{\frac{3}{2}} =$

$\boldsymbol{h})$ $(y^{-\frac{4}{5}})^{-\frac{1}{4}} =$

$\boldsymbol{i})$ $(b^{\frac{3}{4}})^{\frac{1}{3}} =$

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Example (2): Simplify each expression.

a) $x^{\frac{2}{3}} \times x^{\frac{1}{6}} =$

b) $z^{-\frac{1}{3}} \times z^{\frac{3}{4}} =$

c) $a^{\frac{7}{4}} \times a^{\frac{5}{4}} =$

d) $\left(a^{\frac{2}{5}} \times a^{\frac{1}{5}} \right)^{\frac{10}{3}} = =$

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Example (3): The distance in millions of miles a planet is from the Sun in terms of t, the number of Earth days it takes for the planet to orbit the Sun, can be modeled by the expression $\sqrt[3]{6t^2}$. Write the expression in exponential form.

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Example (4): The depreciation rate is calculated by the expression

1-$\left(\frac{T}{P}\right)^{\frac{1}{n}}$ n where n is the age of the item in years, T is the resale price in dollars, and P is the original price in dollars. Write the expression in radical form for an 8-year-old car that was originally purchased for $52,425

Example (5): The volume V of a regular octahedron with edge length l is given by $V = \frac{l^3\sqrt{2}}{3}$, Write the volume in simplest form for an octahedron with the given edge lengths $\sqrt{15}$cm.

The properties used to simplify radical expressions involving square roots can be extended to radical expressions involving *n*th roots.

Key Concept • Product Property of Radicals

Words: For any real numbers *a* and *b* and any integer $n > 1$,

$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$, if *n* is even and $a, b \geq 0$, or if *n* is odd.

Examples: $\sqrt{12} \cdot \sqrt{3} = \sqrt{36}$ or 6 and $\sqrt[3]{4} \cdot \sqrt[3]{16} = \sqrt[3]{64}$ or 4

Key Concept • Quotient Property of Radicals

Words: For any real numbers *a* and $b \neq 0$ and any integer $n > 1$,

$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$, if all roots are defined.

Examples: $\sqrt{\frac{x^4}{25}} = \frac{\sqrt{x^4}}{\sqrt{25}} = \frac{x^2}{5}$ or $\frac{1}{5}x^2$ and $\sqrt[3]{\frac{27}{8}} = \frac{\sqrt[3]{27}}{\sqrt[3]{8}} = \frac{3}{2}$

- **Key Concept**: Simplest Form of Radical Expressions

A radical expression is in its simplest form when the following conditions are met.

1) The index **n** is as small as possible.
2) The radicand contains no factors (other than 1) that are nth powers of an integer or polynomial.
3) The radicand contains no fractions.
4) No radicals appear in the denominator.

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Example (1): Simplify Expressions with the Product Property .

a) $\sqrt[3]{-27\, a^6\, b^{14}}$ =

b) $\sqrt{75x^{12}y^7}$ =

c) $\sqrt[4]{4\, x^5\, y^{20}}$ =

d) $\sqrt{75x^{12}y^7}$ =

e) $\sqrt[3]{-8\, d^4\, f^5}$ =

d) $\sqrt{75x^{12}y^7}$ =

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Example (2): Simplify Expressions with the Quotient Property .

a) $\sqrt[3]{\frac{27a^6}{125}}$ =

b) $\sqrt{\frac{9x^8y^{13}}{49x^2}}$ =

c) $\sqrt[3]{\frac{343n^{12}}{64q^6}}$ =

d) $\sqrt{\frac{25r^2t}{36}}$ =

Example (3): Simplify Expressions using Multiply Radicals .

$a)\quad 4\sqrt[5]{-2\,x^2\,y^6}\,.\,3\sqrt[5]{16\,x^4\,y^4}$ =

$b)\quad 2\sqrt{32a^3b^5}\,.\sqrt{8a^7b^2}$ =

Example (4): Add and subtract Radicals .

$a)\quad 6\sqrt{45x} + \sqrt{12} - 3\sqrt{20x}$

$b)\quad \sqrt{28x} + \sqrt{14} + \sqrt{63x}$

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Example (5): Use Conjugates to rationalize the Denominator .

$a)\ \dfrac{3\sqrt{7}}{\sqrt{5}-1}$

$b)\ \dfrac{x+1}{\sqrt{x}-1}$

- **Example (1):** Solve a square root equation .

a) $\sqrt{3x-5}+2=6$

b) $4(2x+6)^{\frac{1}{3}}-9=3$

c) $2+\sqrt{3p+7}=12$

d) $(2y-2)^{\frac{1}{5}}+5=7$

e) $5+\sqrt{3m+9}=4$

f) $\sqrt[3]{2x+3}=-2$

g) $\sqrt{n+8}=\sqrt{4n-9}$

h) $\sqrt{7a-2}=\sqrt{a+3}$

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مدرسة الحصن للتعليم الثانوي

Mathematics, Grade 12 general

Module (6)

Logarithmic Functions

ملاحظة: الكتاب المدرسي مرجع أساسي للطالب

2025-2026

إعداد: أ. محمد راشد الزّن

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- **Key Concept. Logarithms with Base b**
- **Words : Let b and x be positive numbers, b ≠ 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 ≠ 1. For x > 0, there is a number y such that $\log_b x = y$ if and only if $b^y = x$.**
- **Example: If $\log_2 8 = y$, then $2^y = 8$.**

Example (1): Write each logarithmic equation in exponential form .

a) $\log_4 64 = 3$

b) $\log_{125} 5 = \frac{1}{3}$

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

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

Example (2): Write each exponential equation in logarithmic form .

a) $7^6 = 117,649$

b) $8^{-3} = \frac{1}{512}$

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

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

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Example (3): Evaluate each expression .

a) $\log_2 64 =$

b) $\log_{10} 100000 =$

c) $\log_{10} 0.0000001 =$

d) $\log_9 1 =$

Example (4):

a) The electric current in amperes in a particular circuit can be represented by $\log_2 i = -t$, where t is given in seconds. Write an equation to find the current when time is known.

b) The value of a guitar in dollars after x years can be modeled by the equation $y = g(1.0065)^x$, where g is the initial cost of the guitar. If a guitar costs $400, write an equation to find the number of years it takes for a guitar to reach a certain value.

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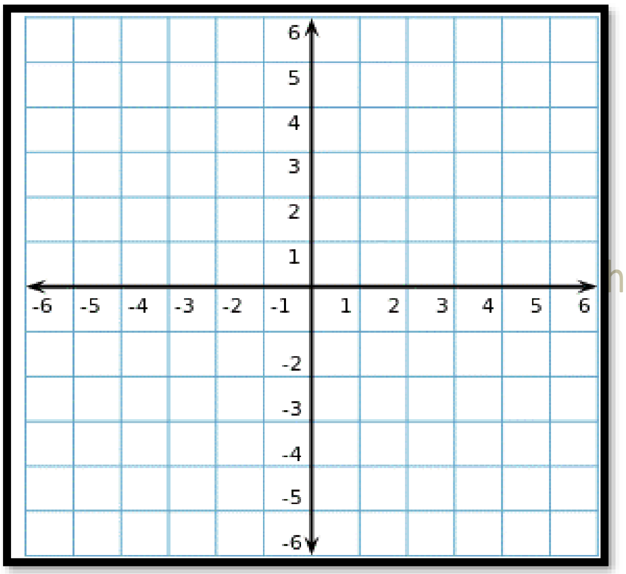
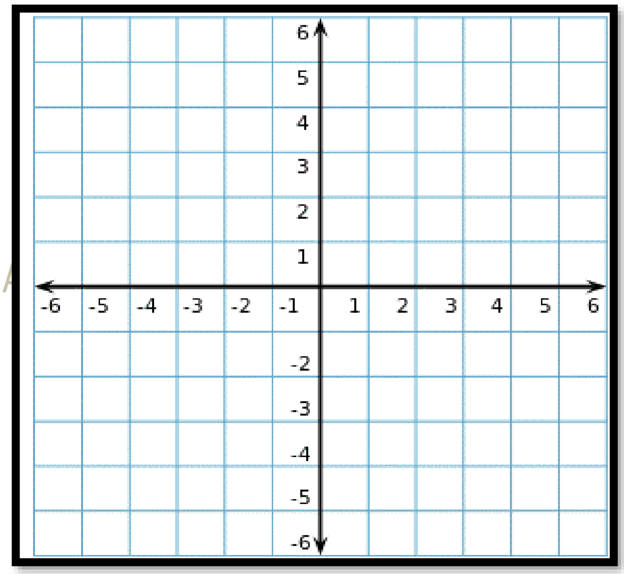
Example (5): Graph each function , then find the **intercepts** , **domain** , **range** , **asymptote** and end **behavior** .

a) $f(x) = \log_2 x$ b) $f(x) = \log_{\frac{1}{3}} x$





Key Concept: Transformations of Logarithmic Functions

$$g(x) = a\log_b(x \pm h) \pm k$$

1) If h > 0, the graph of f(x) is translated **h** units right. (**h - horizontal translation).**
2) If h < 0, the graph of f(x) is translated |h| units left. (**h - horizontal translation).**
3) If k > 0, the graph of f(x) is translated k units up.**(k - vertical translation).**
4) If k < 0, the graph of f(x) is translated |k| units down**.** .**(k - vertical translation).**
5) If a < 0, the graph is reflected in the x-axis.(**a - reflection**)
6) If |a| > 1, the graph is stretched vertically. (**dilation**)
7) If 0 < a < 1, the graph is compressed vertically. (**dilation**)

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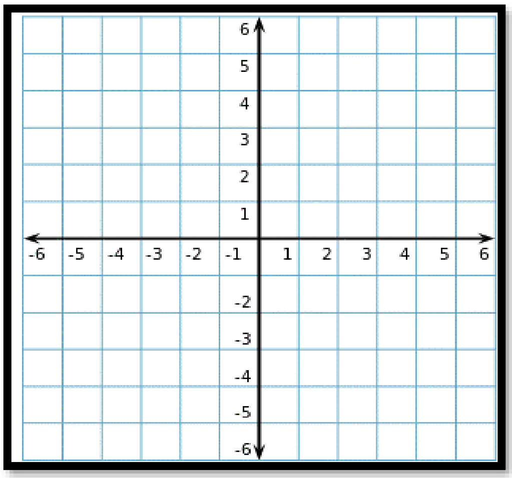
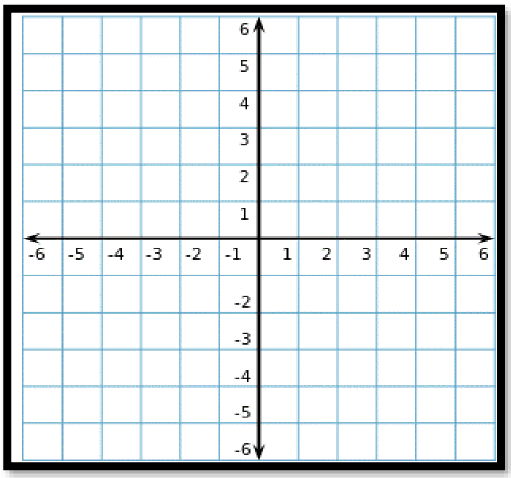
Example (6): Graph each function , then find the **intercepts** , **domain** , **range** , **asymptote** and end **behavior .**

a) $\mathbf{f(x) = 2\log_{10}(x+3) - 1}$



b) $\mathbf{f(x) = \log_{3}(x-1) + 2}$



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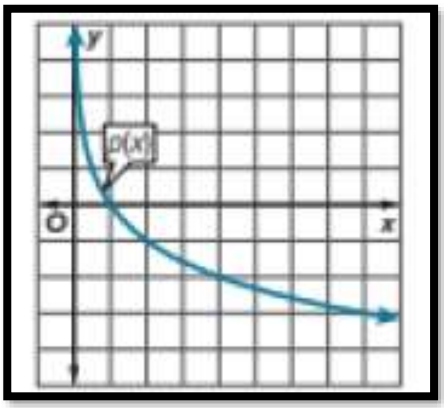
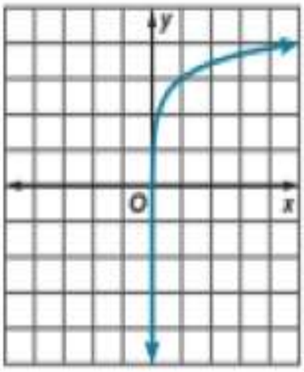
Example (7): Consider $g(x) = \log_{10}(x-4)$ and p(x) shown in the graph .



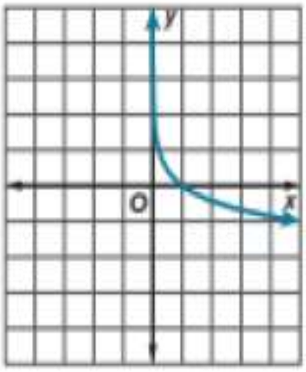
- **Compare the end behavior of g(x) and p(x) .**

Example (8): Identify the value of **K** .

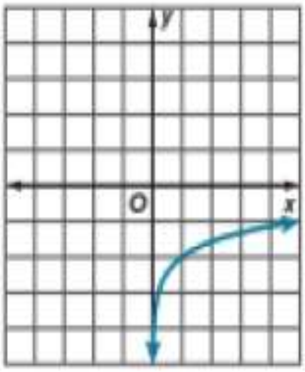
34. $g(x) = f(x) + k$



35. $h(x) = k \cdot f(x)$



36. $j(x) = f(x) + k$



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Example (1): Solve each equation .

a) $\log_4 x = \frac{5}{2}$

b) $\log_9 x = \frac{3}{2}$

Example (2): Solve each equation .

a) $\log_5(2x^2 - 6) = \log_5 4x$

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

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

d) $\log_2 x + \log_2(x+2) = \log_2 8$

Properties of Logarithms

For logarithms base a

1. $\log_a xy = \log_a x + \log_a y$
2. $\log_a \frac{x}{y} = \log_a x - \log_a y$
3. $\log_a x^y = y \cdot \log_a x$
4. $\log_a a^x = x$
5. $a^{\log_a x} = x$

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Example (3): Use $\log_4 2 \approx 0.5$, $\log_4 3 \approx 0.7925$, $\log_4 5 \approx 1.1610$

a) $\log_4 64 =$

b) $\log_4 30 =$

c) $\log_4 \frac{2}{3} =$

Example (4): Use $\log_2 3 \approx 1.585$, $\log_2 5 \approx 2.3219$. $\log_3 7 \approx 1.7712$.

a) $\log_2 625 =$

b) $\log_2 243 =$

c) $\log_2 \frac{27}{125} =$

d) $\log_3 15309 =$

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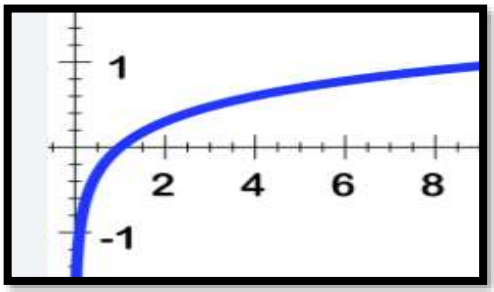
- $\log_{10} x = \log x \ , \ x > 0$



$log\, x = y$	Means	$10^y = x$
$log\, 1 = 0$	Becouse	$10^0 = 1$
$log\, 10 = 1$	Becouse	$10^1 = 10$
$log\, 100 = 2$	Becouse	$10^2 = 100$
$log\, 10^m = m$	Becouse	$10^m = 10^m$

Example (1): Use a calculator to evaluate each expression to the nearset ten-thousandth.

$a)\ \ \boldsymbol{log\, 18} =$ $\qquad$ $b)\ \ \boldsymbol{log\, 42.3} =$

Example (2): The amount of energy E in ergs that is released by an earthquake is related to its Richter scale magnitude M by the equation **log E = 11.8 + 1.5M**. Although the scale was created in the 1930s, earthquakes that occurred before its invention have been estimated using the Richter scale. For example, an earthquake in Cyprus in **1222** is estimated to have measured **7** on the Richter scale. How much energy (**E**) was released?

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Example (3): Solve each equation , Round to the nearset ten-thousandth .

$a)\ 11^x = 101$ $\quad$ $b)\ 7^y = 15$

Example (4): Express each logarithm in term of common logarithms , Round to the nearset ten-thousandth .

$a)\ \log_4 22$ $\quad$ $b)\ \log_3 2 =$

Example (5): Given that $\log_{10} 2 \approx 0.3010$, $\log_{10} 3 \approx 0.4771$.

Explain how to find $\log_2 3$?

Example (6): Which equation could be used to determine $12\log_x 8 = 15$

$a)\ \frac{5}{4} = \frac{\log x}{\log 8}$ $\quad$ $b)\ \frac{5}{4} = \frac{\log 8}{\log x}$ $\quad$ $c)\ 3 = \frac{\log x}{\log 8}$ $\quad$ $d)\ 3 = \frac{\log 8}{\log x}$

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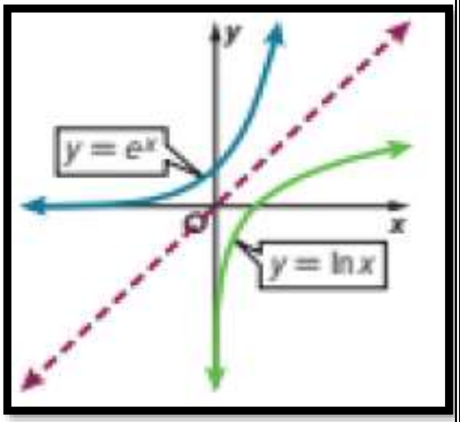
Example (1): Write each exponential equation in logarithmic form .



$a)\ e^{15} = x$

$b)\ e^{4} = 8x$

Example (2): Write each logarithmic equation in exponential form .

$a)\ ln\,50 = x$

$b)\ ln\,(4x) = 9.6$

Example (3): Write each expression as a single logarithm .

$a)\ 3ln\,3 - ln9$

$b)\ 2ln\,x + 2ln\,4$

$c)\ ln\,25 - 2ln5$

d) $3ln\,10 + 2ln\,100 - 4ln\,10$

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Example (4): Solve each equation , Round to the nearset ten-thousandth .

$a)\ 2e^{x} - 1 = 11$

$b)\ e^{3x} = 30$

Example (5): Solve each equation , Round to the nearset ten-thousandth .

$a)\ ln(x - 6) = 1$

$b)\ ln\, 3x = 2$

Example (6): Given that $ln5 \approx 1.6094$, $ln\,8 \approx 2.0794$. evaluate each expression without using calculator .

$a)\ ln\,2 =$

$b)\ ln200 =$

- **Continuously Compounded Interest :** $A = Pe^{rt}$

P = initial amount , A = amount at time **t** , **r** = interest rate

Example (7): Monique wants to invest **$4,000** in a savings account that pays 3.4% annual interest compounded continuously. The formula $A = Pe^{r.t}$ is used to find the amount in the account, where A is the amount in the account after **5** years, P is the principal amount invested, and r is the annual interest rate.

a. What is the balance of Monique's account after 5 years?

b. Suppose Monique wants to wait until there is at least $6,000 in her account before withdrawing any money. How long must she keep her money in the savings account?

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- **Continuously Compounded Interest :** $A = Pe^{rt}$

P = initial amount , A = amount at time **t** , **r** = interest rate

- **Continuous Exponential Growth :** $y = ae^{kt}$

a = initial population , **y** = population at time , **k** = rate of continuous growth.

Example (1): In 2016, the population of Florida was 20.61 million people. In 2000, it was 15.98 million.

A) Write an exponential growth equation.

B) Predict when the population will reach 25 million people.

Example (2): 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 in billions of years after 2000.

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

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Example (3) : 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.

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

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

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Example (4) : A radioactive substance has a half-life of **32** years.

A) Determine the value of k and the equation of decay for this radioactive substance.

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B) How much of a 5-gram sample of the radioactive substance should be left after 100 years?

Example (5): Alaska ranks as the 48th state when comparing population sizes. In 1980, the population was 410,851 and in 2010 the population was 713,985. Which equation models the population of Alaska 2 years after 1980?

$a)\ y = 410,851e^{0.0184t}$

$b)\ y = 410,851e^{-0.0184t}$

$c)\ y = 713,985e^{0.0184t}$

$d)\ y = 713,985e^{-0.0184t}$

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