شرح دوال القيمة المطلقة والتحويلات الهندسية

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موقع المناهج ⇦ المناهج الإماراتية ⇦ الصف العاشر ⇦ رياضيات ⇦ الفصل الأول ⇦ ملفات متنوعة ⇦ 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
إعداد: عبدالله السباعي

التواصل الاجتماعي بحسب الصف العاشر					
صفحة المناهج الإماراتية على فيسبوك					

المزيد من الملفات بحسب الصف العاشر والمادة رياضيات في الفصل الأول	
1	كتاب الطالب Reveal ريفيل المجلد الأول
2	التوزيع الزمني للخطة الفصلية الفصل الأول للعام 2022-2023
3	توزيع مقرر الرياضيات

تحميل تطبيق المناهج للهواتف الذكية	
تطبيق المناهج على Store App (آبل)	تطبيق المناهج على Play Google (أندرويد)

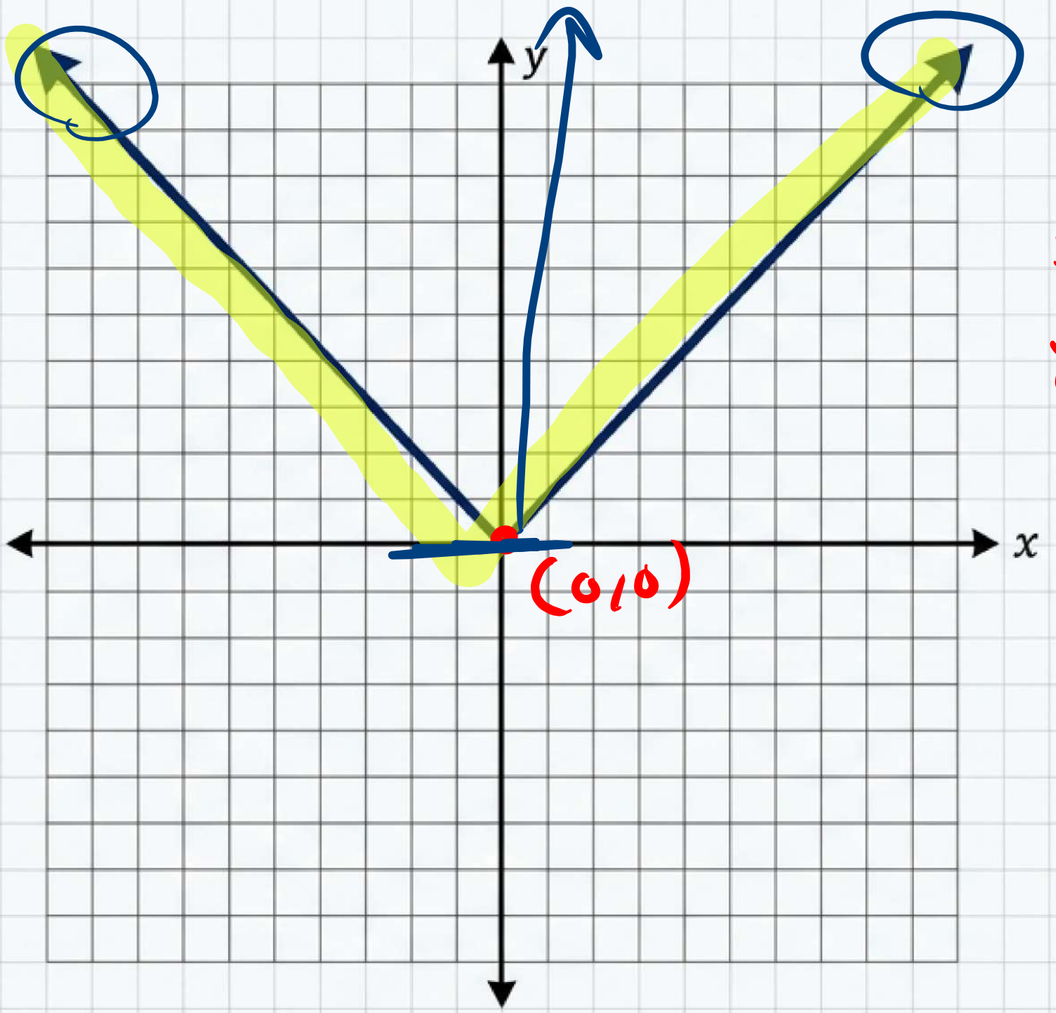
4-7 Absolute Value Functions

A Complete Explainer & Interactive Student Workbook

إعداد عبدالله السباعي

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The Foundation: The Parent Function $y = |x|$



Type of Graph	V-Shaped
Domain (مجال x)	All real numbers
Range (مدى y)	All nonnegative real numbers
Piecewise Definition	$f(x) = x$ if $x \geq 0$, and $-x$ if $x < 0$

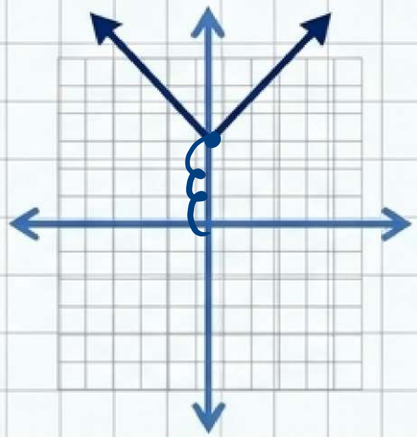
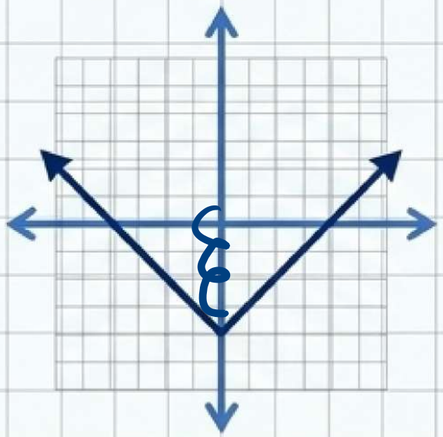
ملحوظة بسيطة

The vertex is either the lowest or highest point of a function. For the parent function $y = |x|$, the vertex is precisely at the origin (0,0).

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Vertical Translations: The k Parameter

$$g(x) = |x| + k$$

Translating UP ($k > 0$)	Translating DOWN ($k < 0$)
If $k > 0$, the graph shifts k units up. $g(x) = \|x\| + 3$ 	If $k < 0$, the graph shifts $\|k\|$ units down. $g(x) = \|x\| - 3$ 

ملحوظة بسيطة

Because the constant k is OUTSIDE the absolute value signs, it affects the output (y-values) directly!

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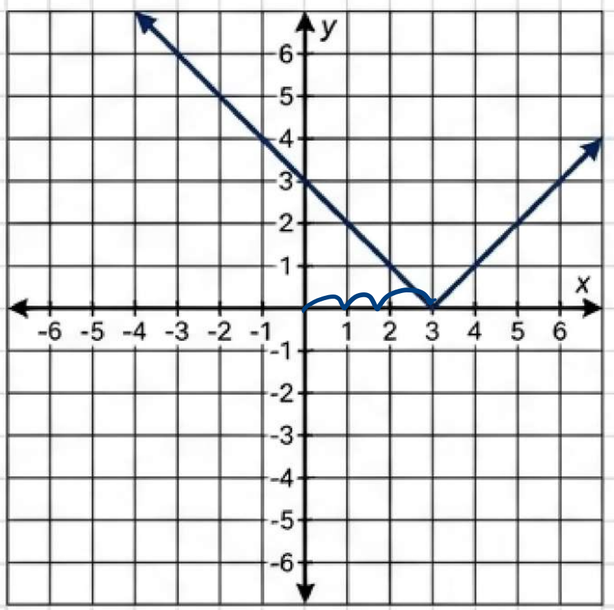
Horizontal Translations: The h Parameter

$$j(x) = |x - h|$$

Translating RIGHT ($h > 0$)

If $h > 0$, the graph shifts h units **right**.

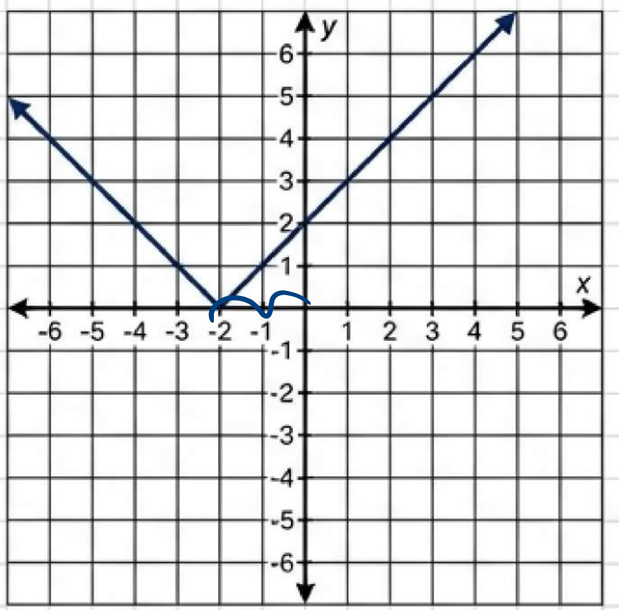
$$j(x) = |x - 3|$$



Translating LEFT ($h < 0$)

If $h < 0$, the graph shifts $|h|$ units **left**.

$$j(x) = |x + 2|$$



ملحوظة بسيطة

WATCH OUT! The general form is $|x - h|$. So, $y = |x + 7|$ is actually $y = |x - (-7)|$. This means $h = -7$, so the graph shifts LEFT, not right!

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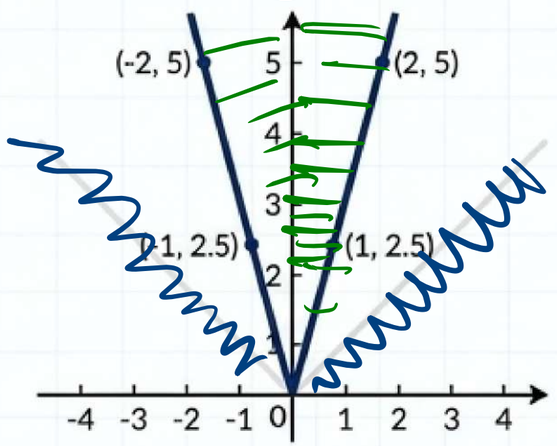
Vertical Dilations: Stretches and Compressions

$$g(x) = a|x|$$

$|a| > 1$: Vertical Stretch

The graph becomes narrower and steeper, as if pulled from the top.

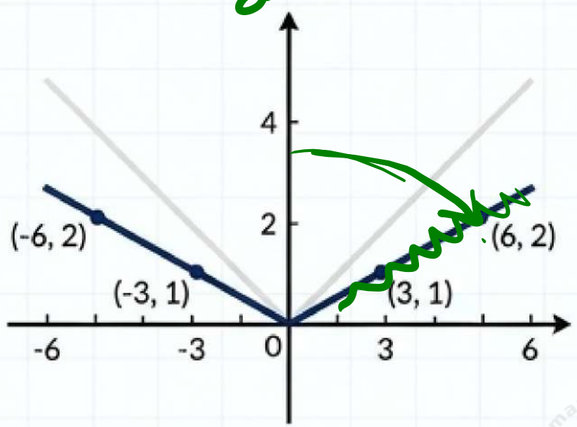
$$g(x) = \frac{5}{2}|x|$$



$0 < |a| < 1$: Vertical Compression

The graph becomes wider and flatter, as if pressed down from above.

$$j(x) = \frac{1}{3}|x|$$



ملحوظة بسيطة

Think of vertical dilations like pulling a rubber band from the top (stretch) or pressing down on it from above (compression).

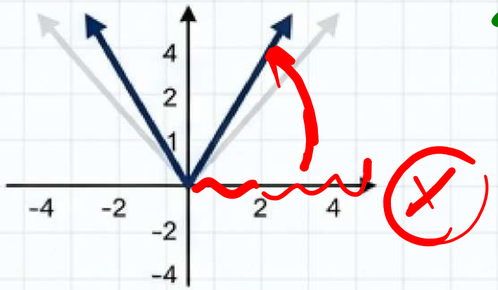
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Horizontal Dilations: Inside the Function

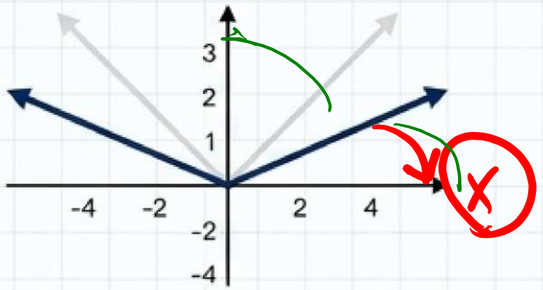
When an input is multiplied by a constant 'a' BEFORE the absolute value is evaluated, a horizontal change occurs. Focus on $p(x) = |ax|$.

Horizontal Compression ($|a| > 1$)	Horizontal Stretch ($0 < |a| < 1$)
The graph is squeezed inward horizontally.	The graph is pulled outward horizontally.

$p(x) = |2x|$



$p(x) = |0.5x|$



ملحوظة بسيطة

Inside vs. Outside! Although $2|x|$ and $|2x|$ might appear to have the same effect, they evaluate differently. When facing complex horizontal transformations, it is always safest to create an (x, y) table to verify your points.

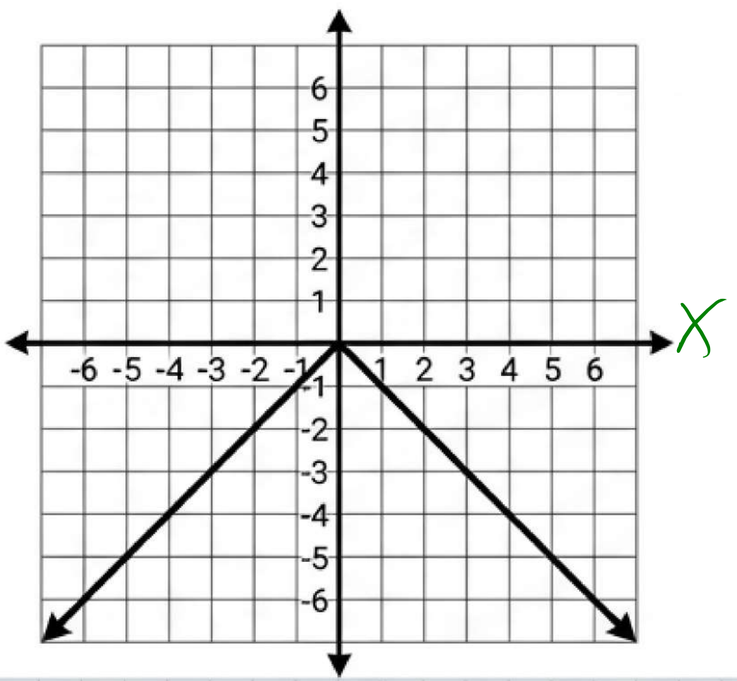
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Reflections: Flipping the Graph

Reflection across the x-axis

$$y = -|x|$$

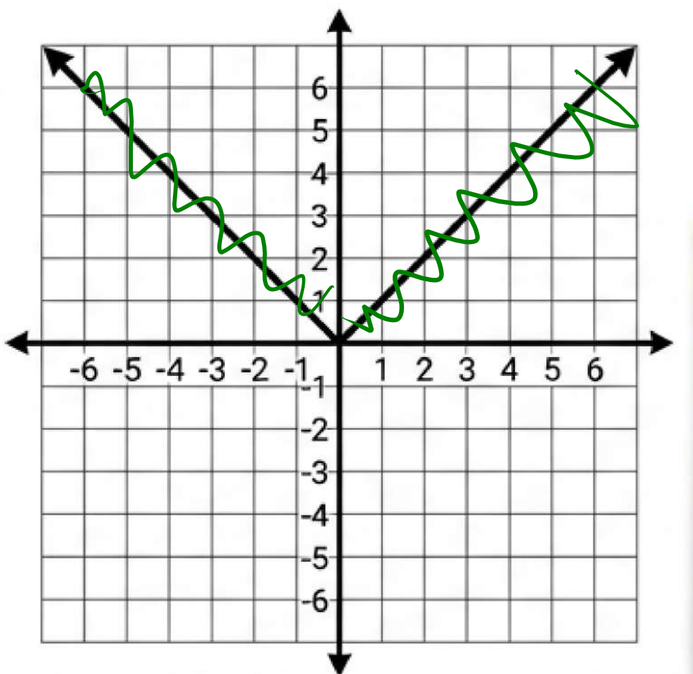
The graph of $-f(x)$ is flipped upside down across the x-axis.



Reflection across the y-axis

$$y = |-x|$$

The graph of $f(-x)$ is reflected across the y-axis. Because the parent function is symmetric, this looks exactly the same as the original parent grant graph!



ملحوظة بسيطة

If "a" is negative (e.g., $y = -2|x|$), the graph opens DOWN. Think of it as an umbrella protecting you from the rain!

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The Master Framework: Putting It All Together

Controls Dilation (Stretch/Compression) and Reflection (Opens Up/Down). Acts somewhat like the slope of the right-hand branch.

Controls Vertical Translation. Moves the vertex up or down.

$$g(x) = a|x - h| + k$$

Controls Horizontal Translation. Moves the vertex left or right. **Remember: opposite sign of what you see inside!**



ملحوظة بسيطة

The Golden Rule of Graphing: Find your vertex first! The vertex is always located precisely at the coordinate (h, k).

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Practice Workbook: Translations

1. Describe the translation in $g(x) = |x| - 5$ as it relates to the parent function.

(A) 5 units up (B) 5 units down (C) 5 units left (D) 5 units right



2. Describe the translation in $g(x) = |x + 6|$ as it relates to the parent function.

(A) 6 units up (B) 6 units down (C) 6 units left (D) 6 units right

3. Describe the translation in $g(x) = |x - 2| + 7$ as it relates to the parent function.

(A) 2 left, 7 down (B) 2 right, 7 down (C) 2 right, 7 up (D) 2 left, 7 up

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Practice Workbook: Translating Equations

|x|

4. The parent function is translated 1 unit left and 3 units down. Which equation represents this new function?

(A) $g(x) = |x - 1| - 3$ **(B)** $g(x) = |x + 1| - 3$ **(C)** $g(x) = |x - 1| + 3$ **(D)** $g(x) = |x + 1| + 3$

|x+1| -3

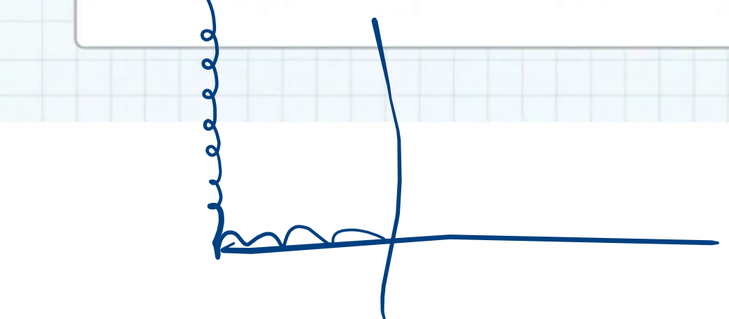
5. Which of the following functions translates the parent graph exactly 8 units to the right?

(A) $g(x) = |x - 8|$ **(B)** $g(x) = |x + 8|$ **(C)** $g(x) = |x| - 8$ **(D)** $g(x) = |x| + 8$

6. What is the vertex of the function $g(x) = |x + 4| + 9$?

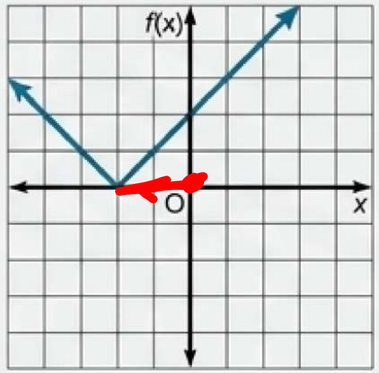
(A) (4, 9) **(B)** (-4, -9) **(C)** (-4, 9) **(D)** (4, -9)

(-4,9)



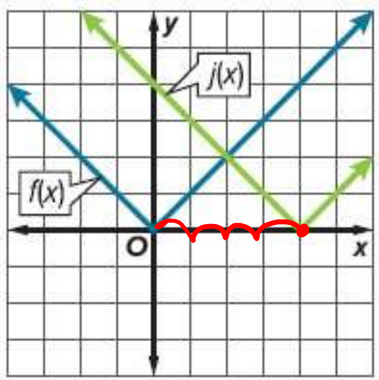
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Practice Workbook: Identifying Graphs



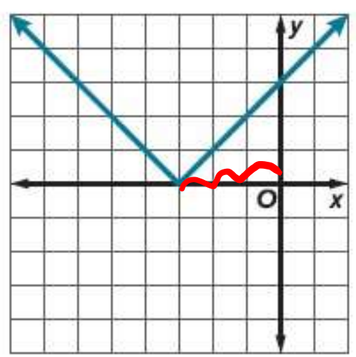
7. Observe the graph. Which equation represents this graph?

(A) g(x) = |x – 2| (B) g(x) = |x + 2| (C) g(x) = |x| – 2 (D) g(x) = |x| + 2



8. Observe the graph. Which equation represents this graph?

(A) f(x) = |x| - 4 (B) f(x) = |x| + 4 (C) f(x) = |x – 4| (D) f(x) = |x + 4|



9. Observe the graph. Which equation represents this graph?

(A) f(x) = |x - 3| - 3 (B) f(x) = |x + 3| - 3 (C) f(x) = |x + 3| (D) f(x) = |x - 3| + 3

|x+3|

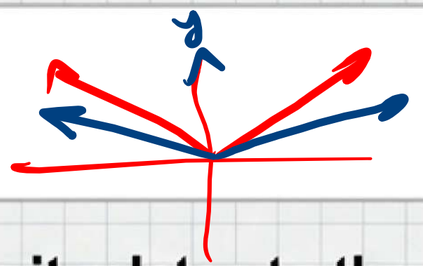
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Practice Workbook: Dilations

10. Describe the dilation in $g(x) = \frac{2}{5}|x|$ as it relates to the parent function.

(A) Vertical stretch (B) Vertical compression (C) Horizontal compression (D) Horizontal stretch

$\frac{2}{5} < 1$



11. Describe the dilation in $g(x) = |0.7x|$ as it relates to the parent function.

(A) Vertical stretch (B) Vertical compression (C) Horizontal compression (D) Horizontal stretch

$|\frac{7}{10}x| \Rightarrow \frac{10}{7} > 1$

12. Describe the dilation in $g(x) = 1.3|x|$ as it relates to the parent function.

(A) Vertical stretch (B) Vertical compression (C) Horizontal stretch (D) Horizontal compression

$1.3 > 1$

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Practice Workbook: Reflections

13. Describe the reflection in $g(x) = -3|x|$ as it relates to the parent function.

(A) Reflected across y-axis (B) Reflected across x-axis (C) Reflected across origin (D) No reflection

14. Describe the transformation in $g(x) = -|x| - 2$.

(A) Reflected across x-axis, translated 2 down (B) Reflected across y-axis, translated 2 down (C) Reflected across x-axis, translated 2 left (D) Reflected across y-axis, translated 2 left

15. Describe the reflection in $g(x) = \left|-\frac{1}{4}x\right|$.

(A) Reflected across x-axis (B) Reflected across y-axis (C) Reflected across origin (D) Reflected across y=x

$\frac{4}{1} > 1$

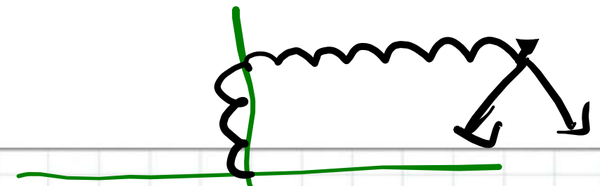
Stretch Horizontal

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Practice Workbook: Mixed Transformations

16. Which phrase best describes how $g(x) = -|x - 7| + 3$ relates to the parent function?

(A) Reflected x-axis, 7 left, 3 up (B) Reflected x-axis, 7 right, 3 up (C) Reflected y-axis, 7 right, 3 up (D) Reflected y-axis, 7 left, 3 down



17. State the domain and range of $g(x) = |x + 2| + 3$.

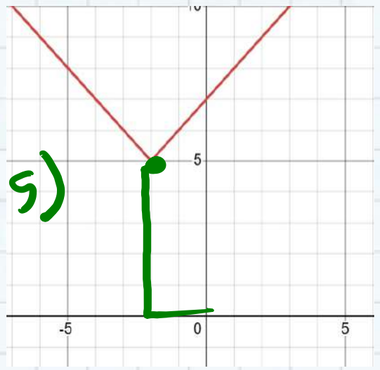
(A) D: All Reals, R: $y \geq 3$ (B) D: $x \geq -2$, R: All Reals (C) D: All Reals, R: $y \geq -2$ (D) D: All Reals, R: $y \leq 3$

18. What is the correct domain and range for the function $f(x) = -4|x + 2| - 3$?

(A) D: All Reals, R: $y \leq -3$ (B) D: All Reals, R: $y \geq -3$ (C) D: All Reals, R: $y \leq -4$ (D) D: All Reals, R: $y \geq -2$

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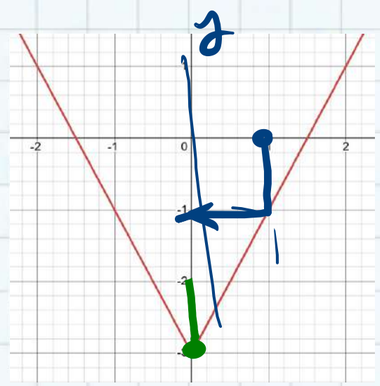
Practice Workbook: Complex Graphs



19. Use the graph to write its equation.

(A) $y = |x - 2| - 5$ (B) $y = |x + 2| - 5$ (C) $y = |x + 2| + 5$ (D) $y = |x - 2| + 5$

x-h
|x+2| +5

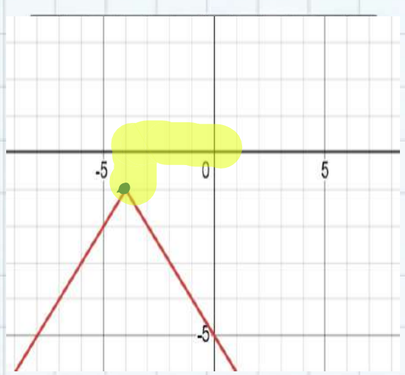


20. Use the graph to write its equation.

(A) $y = 2|x| + 3$ (B) $y = \frac{1}{2}|x| + 3$ (C) $y = \frac{1}{2}|x| - 3$ (D) $y = 2|x| - 3$

$\frac{1}{2}|1| - 3$
$0.5 - 3 = -2.5$

$2|1| - 3$
$2(1) - 3$
$2 - 3 = -1$



21. Use the graph to write its equation.

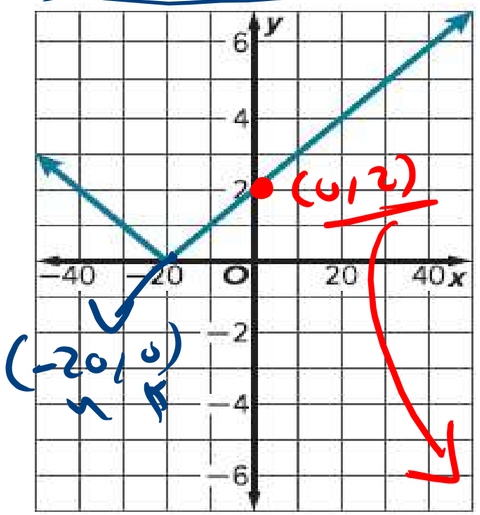
(A) $y = -|x + 4| - 1$ (B) $y = -|x - 4| - 1$ (C) $y = -|x - 4| + 1$ (D) $y = |x - 4| - 1$

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Practice Workbook: Real-World Models I

Determine an absolute value function that models each situation.

ESCALATORS An escalator travels at a constant speed. The graph models the escalator's distance, in floors, from the second floor x seconds after leaving the ground floor.



A) $f(x) = 0.1|x - 20|$

B) $f(x) = 0.1|x + 20|$

C) $f(x) = 0.2|x + 20|$

D) $f(x) = 0.1|x| + 20$

$y = a|x - h| + k$

$y = a|x + 20| + 0$

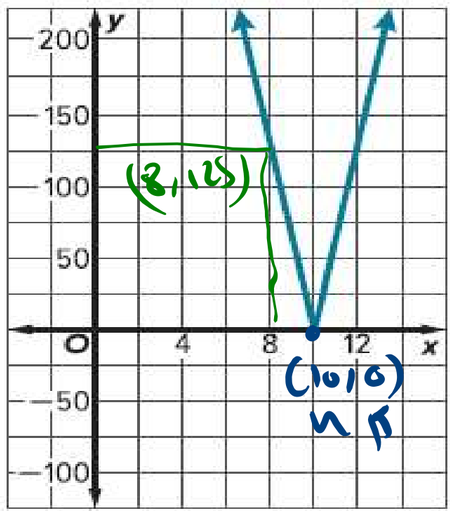
$2 = a|0 + 20|$

$\frac{2}{20} = \frac{a \times 20}{20}$

$\frac{1}{10} = a$

$y = \frac{1}{10}|x + 20|$

TRAVEL The graph models the distance, in miles, a car traveling from Chicago, Illinois is from Annapolis, Maryland, where x is the number of hours since the car departed from Chicago, Illinois.



A) $f(x) = 50|x + 10|$

B) $f(x) = 25|x - 10|$

C) $f(x) = 62.5|x - 10|$

D) $f(x) = 100|x - 10|$

$y = a|x - h| + 0$

$125 = a|8 - 10|$

$125 = a|-2|$

$125 = a \times 2$

$62.5 = a$

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