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Chapter 2 Practice

Name: Key

Use the function to evaluate the indicated expressions and/or simplify.

1. $f(x)=2x^2-x+12$; find $f(a+5)$

$(a+5)^2 = (a+5)(a+5)$
$= a^2+5a+5a+25$
$= a^2+10a+25$

$f(a+5) = 2(a+5)^2-(a+5)+12$
$= 2(a^2+10a+25)-(a+5)+12$
$= 2a^2+20a+50-a-5-12+12$
$f(a+5) = 2a^2+19a+33+57$

2. $h(x)=\begin{cases}3x^2-1 & \text{if } x<-1\\ 5x-2 & \text{if } x\geq -1\end{cases}$

a) Find $h(0)$ use second function
$h(0) = 5(0)-2$
$h(0) = -2$

b) Find $h(-1)$ use second function
$h(-1) = 5(-1)-2$
$= -5-2$
$h(-1) = -7$

c) Find $h(-2)$ use 1st function
$h(-2) = 3(-2)^2-1$
$= 3(4)-1$
$= 12-1$
$h(-2) = 11$

Find the domain of the function in interval notation.

3. $h(x)=\dfrac{x-3}{x+8}$ $(-\infty,-8)\cup(-8,\infty)$
$x\neq -8$

4. $f(x)=\sqrt{4-x}$ $(-\infty,4]$
$4-x\geq 0$
$-x\geq -4$
$x\leq 4$

5. $g(x)=\dfrac{x-3}{x^2+9}$ $(-\infty,\infty)$

6. $r(x)=\dfrac{\sqrt{x-3}}{x-5}$
$x-3\geq 0$
$x\geq 3$
$x\neq 5$

$[3,5)\cup(5,\infty)$

7. $v(x)=\dfrac{4}{x^2-16}$ $(-\infty,-4)\cup(-4,4)\cup(4,\infty)$
$x\neq 4,-4$

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8. Answer the following questions:

The graph of $y = f(3x)$ is the graph of $y = f(x)$ with a (choose one: vertical stretch, vertical shrink, horizontal stretch, horizontal shrink). $f(3x)$ $\frac{1}{3}$

The graph of $y = \frac{1}{3}f(x)$ is the graph of $y = f(x)$ with a (choose one: vertical stretch, vertical shrink, horizontal stretch, horizontal shrink).

The graph of $y = 3f(x)$ is the graph of $y = f(x)$ with a (choose one: vertical stretch, vertical shrink, horizontal stretch, horizontal shrink).

The graph of $y = f(\frac{1}{3}x)$ is the graph of $y = f(x)$ with a (choose one: vertical stretch, vertical shrink, horizontal stretch, horizontal shrink). $f(\frac{1}{3}x) = 3$

The graph of $y = -f(x)$ is the graph of $y = f(x)$ reflected across the x -axis.

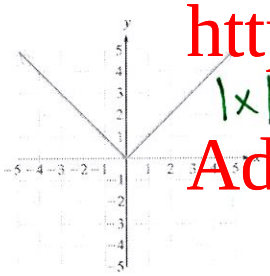
9.

For Exercises 15–20, from memory match the equation with its graph.

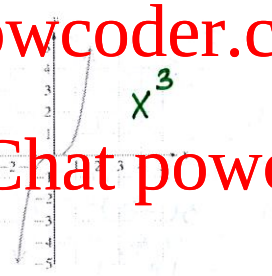
15. $f(x) = \sqrt{x}$ 16. $f(x) = \sqrt[3]{x}$ 17. $f(x) = x$

18. $f(x) = x^2$ 19. $f(x) = |x|$ 20. $f(x) = \frac{1}{x}$

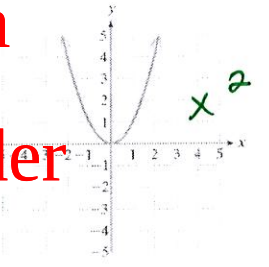
a. |x|



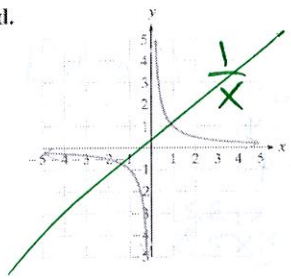
b. x^3



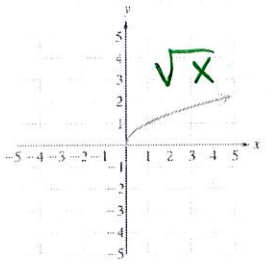
c. x^2



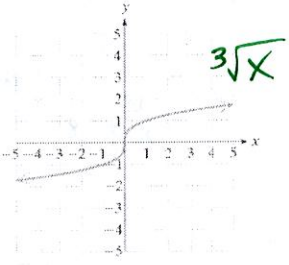
d. $\frac{1}{x}$



e. $\sqrt{x}$



f. $\sqrt[3]{x}$



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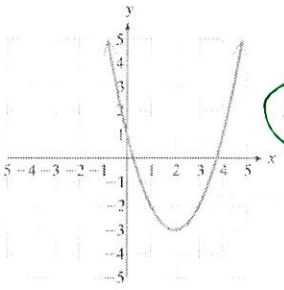
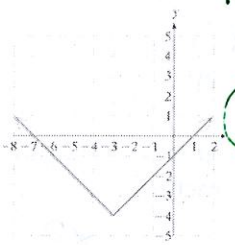
For Exercises 87–92, use transformations on the basic functions presented in Table 2-2 to write a rule $y = f(x)$ that would produce the given graph.



x^2 Right 2, Down 3

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



$|x|$ Left 3 Down 4

$f(x) = |x+3| - 4$

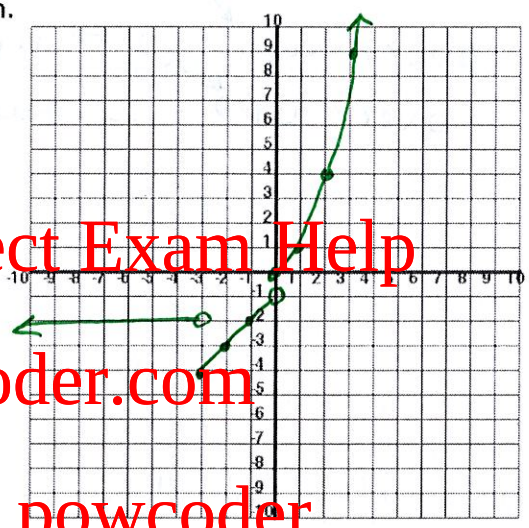
Sketch the graph of the piecewise defined function.

11. $f(x) = \begin{cases} -2 & \text{if } x < -3 \\ x - 1 & \text{if } -3 \le x < 0 \\ x^2 & \text{if } x \ge 0 \end{cases}$

x	-2
less than -3	-2
-4	-2
-5	-2

x	x-1
-3	-4
-2	-3
-1	-2
0	-1

x	x^2
0	0^2
1	1^2
2	2^2
3	3^2



12. For $g(x) = -|x+2| - 1$ $|x|$ ✓

a) Describe the transformations on the graph.

Reflects x-axis ∧

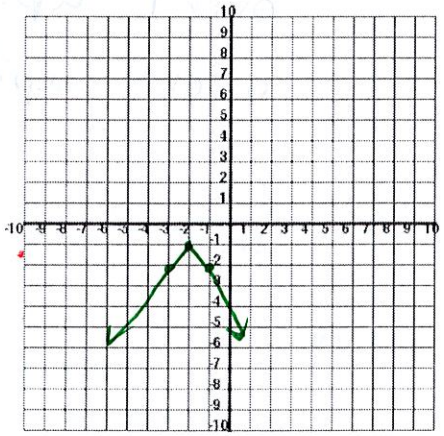
Left 2

Down 1

b) Sketch the graph of the function by applying transformations to the graph of the standard function.

over 1 down

over 2 down 2



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13. For $g(x)=2(x-1)^2-4$

a) Describe the transformations on the graph.

Vertical Stretch by 2 $\times 2$

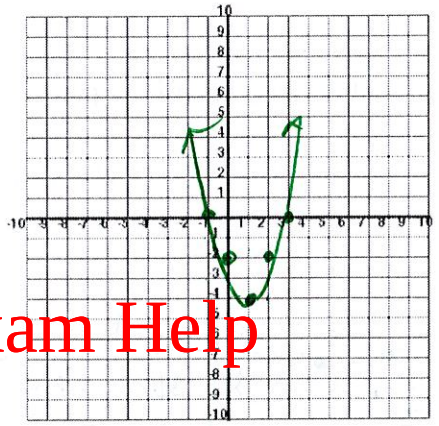
Right 1

Down 4

b) Sketch the graph of the function by applying transformations to the graph of the standard function.

over 1 up 1 $\times 2$

over 2 up 2 $\times 2$ → up 4



14. For $f(x)=\frac{1}{2}\sqrt{x-1}+2$

a) Describe the transformations on the graph.

Vertical compression by $\frac{1}{2}$

Right 1

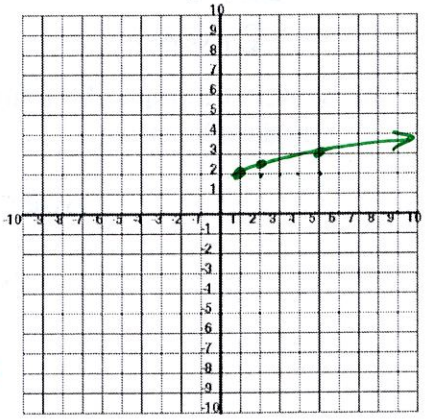
Up 2

$\sqrt{x}$

b) Sketch the graph of the function by applying transformations to the graph of the standard function.

over 1 up 1 $\times \frac{1}{2}$ up $\frac{1}{2}$

over 4 up 2 $\times \frac{1}{2}$ up 1



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A function f is given, and the indicated transformations are applied to its graph (in the given order). Write the equation for the final transformed graph.

15. $f(x)=\sqrt{x}$

The graph is reflected in x-axis, compressed vertically by a factor of ½, right 40 units, up 90 units.

$f(x) = -\frac{1}{2}\sqrt{x-40} + 90$

Use $f(x)=x^2+5x-1$ and $g(x)=3-2x$ to evaluate and/or simplify the expression.

16. Find $(f-g)(x)$.

$f(x)-g(x)$

$(x^2+5x-1)-(3-2x) \rightarrow x^2+5x-1-3+2x$

$(f-g)(x) = x^2+7x-4$

17. Find $(f\cdot g)(1)$.

$f(1)\cdot g(1)$

$(1^2+5\cdot 1-1)\cdot(3-2\cdot 1) = 5\cdot 1 = 5$

$(f\cdot g)(1) = 5$

18. Find $(g\circ f)(x)$

$(g\circ f)(x) = g(f(x))$

$= g(x^2+5x-1) \rightarrow 3-2(x^2+5x-1)$

$= 3-2x^2-10x+2$

$= -2x^2-10x+5$

$(g\circ f)(x) = -2x^2-10x+5$

19. Find $(g\circ g)(2)$

$g(g(2))$

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

$= 3-4$

$= -1$

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

$= 3+2$

$= 5$

$(g\circ g)(2) = 5$

20. Find $f(g(1))$

$f(g(1))$

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

$= 3-2$

$= 1$

$f(1) = (1)^2+5(1)-1$

$= 5$

$f(g(1)) = 5$

21. $(f\circ g)(x)$

$f(g(x)) = f(3-2x) \rightarrow (3-2x)^2+5(3-2x)-1$

$(3-2x)(3-2x)$

$9-6x-6x+4x^2$

$9-12x+4x^2$

$(4x^2-12x+9)+15-10x-1$

$4x^2-22x+23$

$(f\circ g)(x) = 4x^2-22x+23$

22. $(f+g)(-2)$

$f(-2)+g(-2) = [(-2)^2+5(-2)-1]+[3-2(-2)]$

$-7+7$

$(f+g)(-2) = 0$

23. Domain of f: $(-\infty,\infty)$

24. Domain of g: $(-\infty,\infty)$

25. Domain of f + g, f − g, fg: $(-\infty,\infty)$

26. Domain of f/g: $(-\infty,3/2)\cup(3/2,\infty)$

$\frac{f}{g} = \frac{x^2+5x-1}{3-2x} \rightarrow 3-2x\neq 0$

$-2x\neq -3$

$x\neq 3/2$

27. Domain of $(f\circ g)(x)$: $(-\infty,\infty)$

28. Domain of $(g\circ f)(x)$: $(-\infty,\infty)$

$(f\circ g)(x) = (-\infty,\infty)$ + R from g; g is $(-\infty,\infty)$

$(g\circ f)(x) = (-\infty,\infty)$ + R from f; f is also $(-\infty,\infty)$

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29. Find the difference quotient of the function *f*.

That is, find $\frac{f(x+h)-f(x)}{h}$. Use the function $f(x)=5x-3$

$f(x+h) = 5(x+h)-3$
$= 5x+5h-3$

$\frac{5x+5h-3-(5x-3)}{h}$
$= \frac{5h}{h} = 5$

30. Find the difference quotient of the function *f*.

That is, find $\frac{f(x+h)-f(x)}{h}$. Use the function $f(x)=x^2+3x-2$

$f(x+h) = (x+h)^2+3(x+h)-2$
$= (x^2+2xh+h^2)+3x+3h-2$
$(x+h)^2=(x+h)(x+h)$
$f(x+h) = x^2+2xh+h^2+3x+3h-2$

$\frac{x^2+2xh+h^2+3x+3h-2-(x^2+3x-2)}{h}$

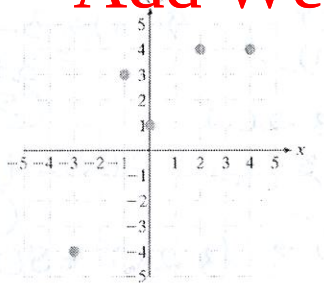
$\frac{2xh+h^2+3h}{h}$

$\frac{h(2x+h+3)}{h}$

$= 2x+h+3$

31 Determine the domain and range for the functions shown.

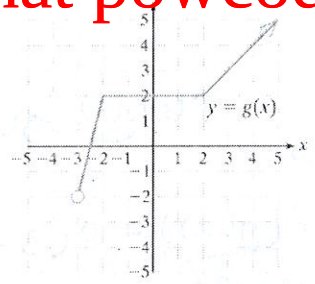
a.



$D=\{-3,-1,0,2,4\}$

$R=\{-4,1,3,4\}$

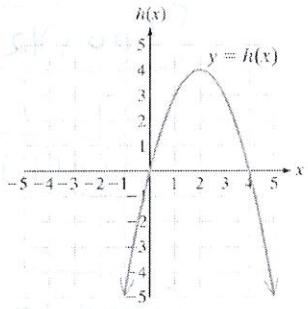
b.



$D=(-3,\infty)$

$R=(-2,\infty)$

c.



$D=(-\infty,\infty)$

$R=(-\infty,4]$

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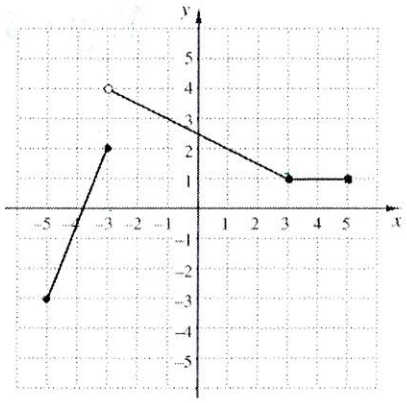
32. Find all information below for the graph of the function.



Find $f(3)$. 1

Find $f(-3)$. 2 (not the open point)

Find $f(6)$. undefined (not graphed)

Find the domain of f in interval notation: [-5, 5]

Find the range of f in interval notation: [-3, 4)

Name the intervals where f is INCREASING. (-5, -3)

Name the intervals where f is DECREASING. (-3, 3)

Name the intervals where f is CONSTANT. (3, 5)

Find all value(s) for x where $f(x) = 2$. -3, 1

The point (-1, 3) lies on the graph of f. What would that point become on the graph of $y = f\left(\frac{1}{3}x\right)$?

(-3, 3)

Horizontal Stretch ×3

(-1, 3) → (-3, 3)

The point (-1, 3) lies on the graph of f. What would that point become on the graph of $y = 3f(x)$?

(-1, 9)

Vertical Stretch ×3

(-1, 3) → (-1, 9)

The point (-1, 3) lies on the graph of f. What would that point become on the graph of $y = f(x+5)$?

(-8, 3)

Left 5

(-1 - 5, 3)

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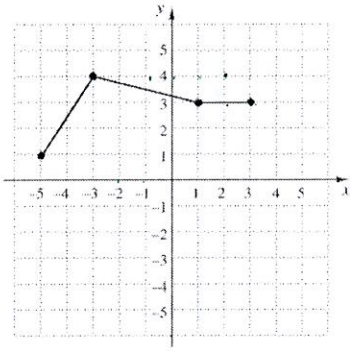
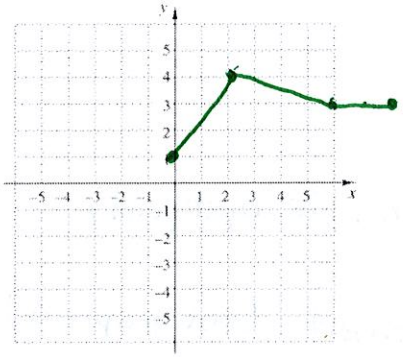
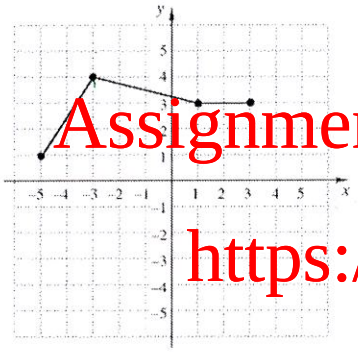
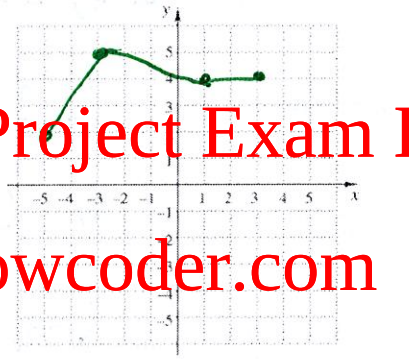
33. The graph of a function $y = f(x)$ is shown below. No formula for f is given. Make a graph of $y = f(x-5)$. Right 5



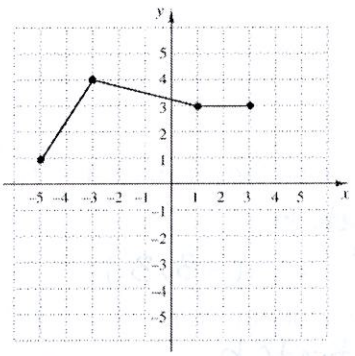


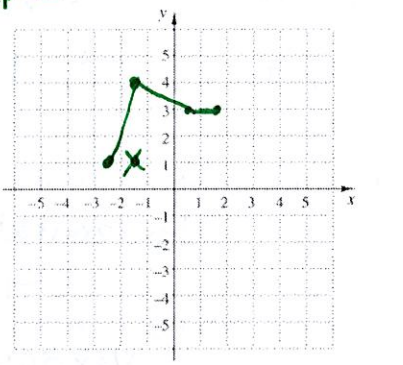
34. The graph of a function $y = f(x)$ is shown below. No formula for f is given. Make a graph of $y = f(x)+1$. up 1





35. The graph of a function $y = f(x)$ is shown below. No formula for f is given. Make a graph of $y = f(2x)$. 1/2 Horizontal Shrink Compress





1/2
(-5, 1) → (-2.5, 1)
(-3, 4) → (-1.5, 4)
(1, 3) → (.5, 3)
(0, 3.5) → (0, 3.5)
(3, 3) → (1.5, 3)

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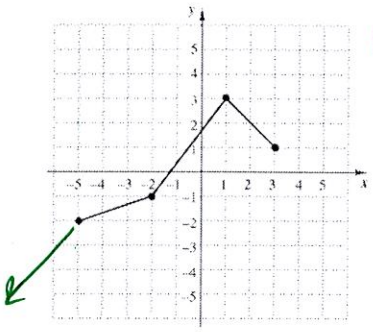
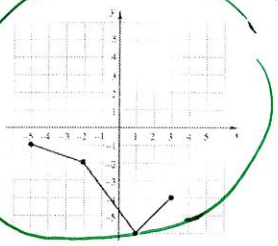
36. The graph of the function f is shown to the left. Which of the following represents the graph of $g(x) = -f(x) - 3$?

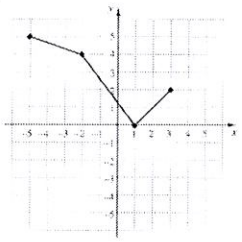


Reflect x (flip over x)
Down 3

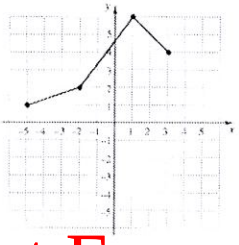
A.



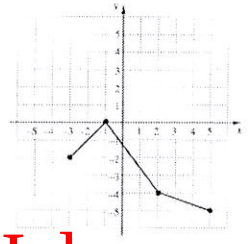
B.



C.

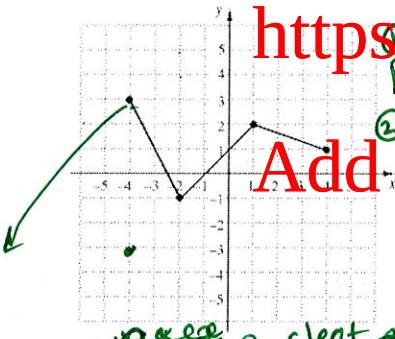


D.



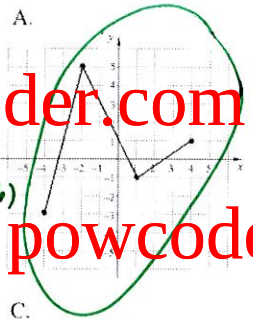
(-5, -2) would be (-5, 2)
then down 3 would be
(-5, -1)

37. The graph of the function f is shown to the left. Which of the following represents the graph of $g(x) = -2f(x) + 3$?

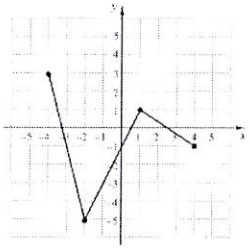


① Reflect x (-4, -3)
② vertical stretch by 2 (-4, -6)
up 3 +3 (-4, -3)

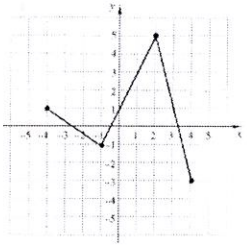
A.



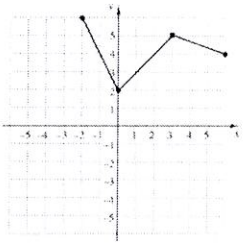
B.



C.



D.



(-4, 3) → Reflect → (-4, -3) → up 3 → vertical stretch → (-4, 0) → (-4, -6)
(-4, 0)
(-4, 3)
×2

38. Write an equation for a function that has the shape of $y = |x|$, but is shifted right 2 units and down 6 units.

a) $f(x) = |x+2| - 6$
b) $f(x) = |x-2| + 6$
c) $f(x) = |x+2| + 6$
d) $f(x) = |x-2| - 6$

Write an equation for a function that has the shape of $y = x^2$, but is shifted left 3 units and up 4 units.

a) $f(x) = (x+3)^2 + 4$
b) $f(x) = (x-3)^2 + 4$
c) $f(x) = (x-3)^2 - 4$
d) $f(x) = (x+3)^2 - 4$