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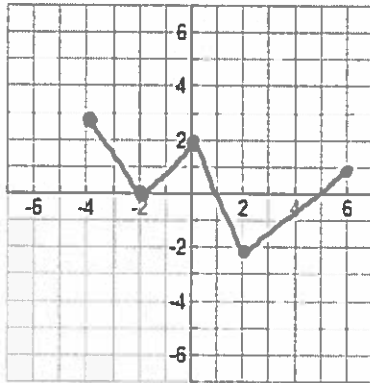
## Q1T2: Study Guide

## Honors PreCalculus

## ALL WORK IS TO BE DONE ON YOUR OWN PAPER

Remember that this is a study *GUIDE* and not the only material you should study. Studying only the problems that appear on this review guide will not be sufficient. You should also review problems from class starters, notes, and homework assignments for additional practice.

TRANSFORMATIONS OF FUNCTIONS: Given the graph of  $f(x)$ , graph each of the following on a coordinate plane.



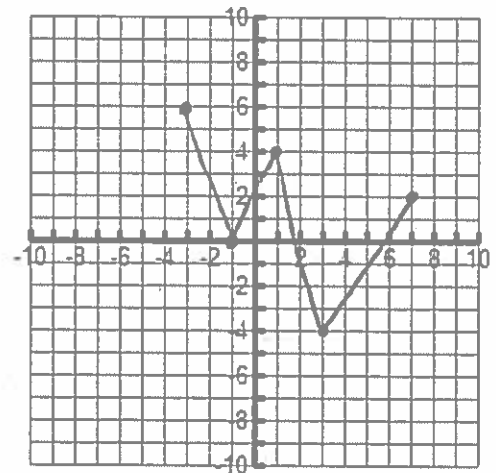
1.  $y = 2f(x-1)$

Vertical stretch of 2  
right 1

X	Y
-3	6
-1	0
1	4
3	-4
7	2

D:  $[-3, 7]$

R:  $[-4, 6]$

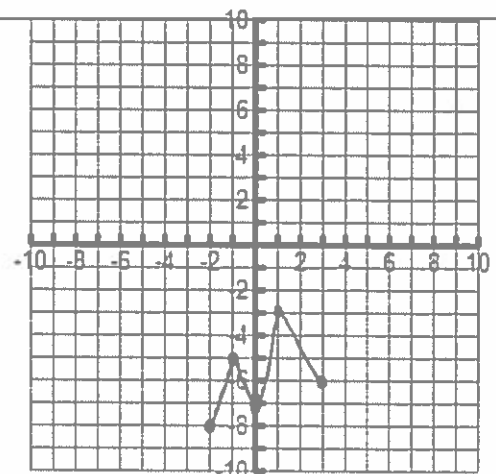


2.  $y = -f(2x) - 5$

reflection over x-axis  
horizontal shrink of  $\frac{1}{2}$   
down 5

D:  $[-2, 3]$

R:  $[-8, -3]$



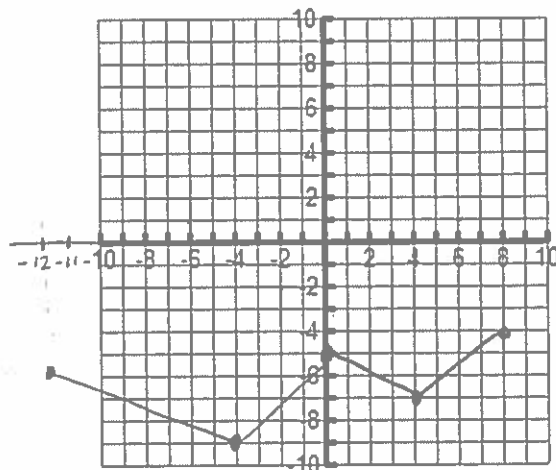
$$3. y = f\left(-\frac{1}{2}x\right) - 7$$

reflection over y-axis  
horizontal stretch of 2  
down 7

$$D: [-12, 8]$$

$$R: [-9, -4]$$

X	Y
-12	-6
-4	-9
0	-5
4	-7
8	-4



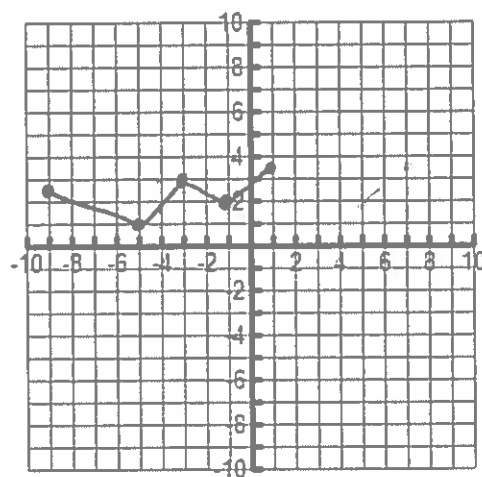
$$4. y = \frac{1}{2}f(-x-3)+2 \rightarrow y = \frac{1}{2}f(-(x+3))+2$$

vertical shrink of  $\frac{1}{2}$   
reflection over y-axis  
left 3  
up 2

$$D: [-9, 1]$$

$$R: [1, 3.5]$$

X	Y
1	3.5
-1	2
-3	3
-5	1
-9	2.5



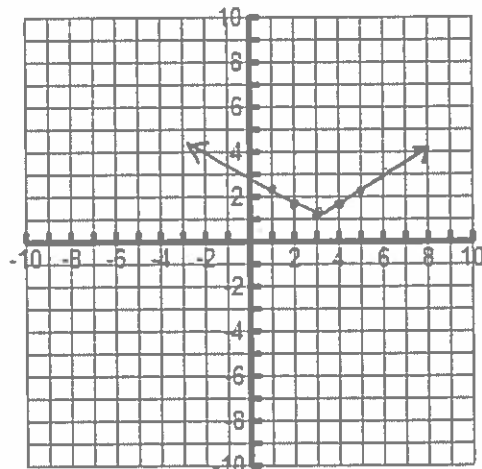
GRAPHING USING THE PARENT FUNCTION: Graph the following functions.

$$5. \frac{4y = 2|x-3| + 5}{4}$$

$$y = \frac{1}{2}|x-3| + \frac{5}{4}$$

Vertical shrink of  $\frac{1}{2}$  ( $\frac{1}{2}y$ )  
right 3 ( $x+3$ )  
up  $\frac{5}{4}$  ( $y + \frac{5}{4}$ )

X	Y
-2	2
-1	1
0	0
1	1
2	2



6.  $y = 2(x+2)^3 - 5$

Vertical stretch of 2 ( $2y$ )

left 2 ( $x-2$ )

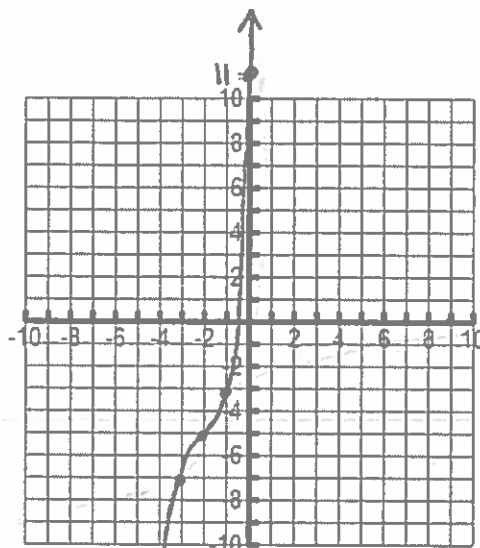
down 5 ( $y-5$ )

Cubic

X	U
-2	-8
-1	-1
0	0
1	1
2	8

$x-2$   $2y-5$

X	Y
-4	-21
-3	-7
-2	-5
-1	-3
0	11



7.  $\frac{2y}{2} = -\frac{\sqrt{x-3}-4}{2} - \frac{4}{2}$

$y = -\frac{1}{2}\sqrt{x-3} - 2$

reflect over x-axis ( $-y$ )

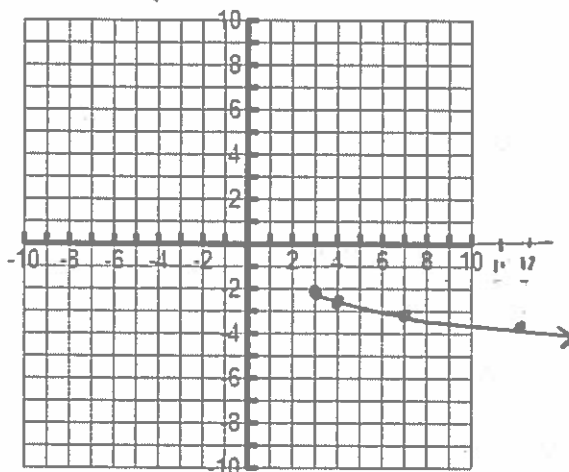
Vertical shrink of  $\frac{1}{2}$  ( $\frac{1}{2}y$ )

right 3 ( $x+3$ )

down 2 ( $y-2$ )

Square Root

X	U
0	0
1	1
4	2
9	3



8.  $y = \frac{1}{2}|x-2| + 1$

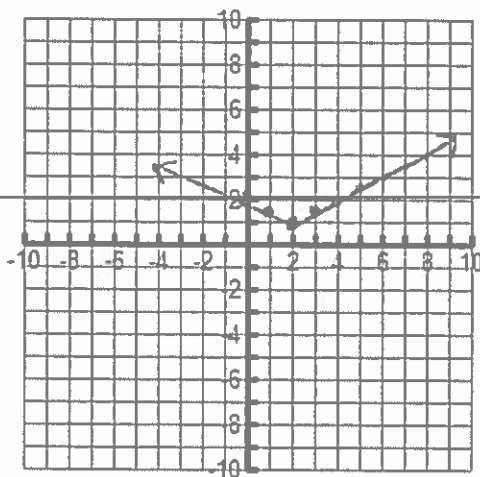
vertical shrink of  $\frac{1}{2}$  ( $\frac{1}{2}y$ )

right 2 ( $x+2$ )

up 1 ( $y+1$ )

Abs Value

X	U
-2	2
-1	1
0	0
1	1
2	2



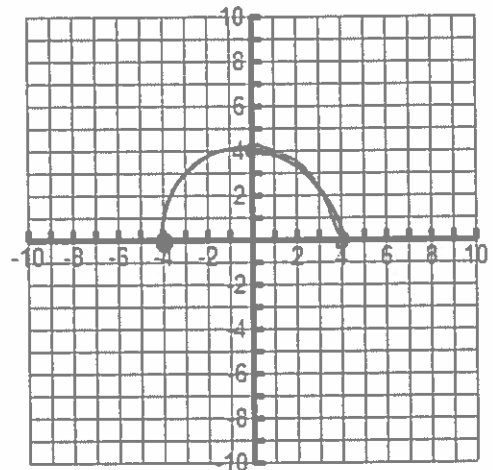
9.  $y = \sqrt{-x^2 + 16}$

$y = \sqrt{16 - x^2}$

↑  
 $r^2$

$r = 4$

Semicircle



10.  $8 - 2y = 3(x-1)^3 + 5$

$-2y = 3(x-1)^3 - 3$

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

reflect over x-axis (-y)

vertical stretch of  $\frac{3}{2}$  (1.5y)

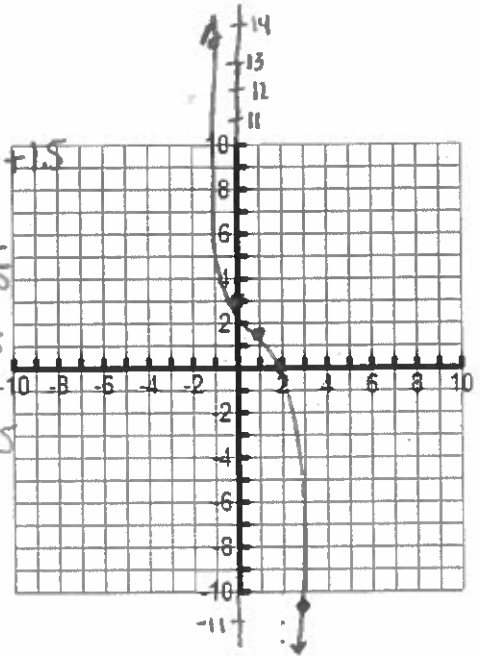
right 1 (x+1)

up  $\frac{3}{2}$  ( $y + \frac{3}{2}$ )

Cubic  $x+1$   $-1.5y + 1.5$

X	Y
-2	-8
-1	-1
0	0
1	1
2	8

X	Y
-1	13.5
0	3
1	1.5
2	0
3	-10.5



11.  $3 - y = \frac{1}{2}(x+3)^2 - 3$

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

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

reflect over x-axis (-y)

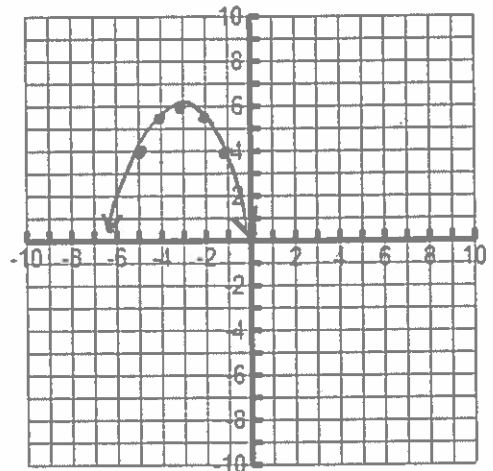
vertical shrink of  $\frac{1}{2}$  ( $\frac{1}{2}y$ )

left 3 (x-3)

up 6 (y+6)

Quadratic

X	Y
-2	4
-1	1
0	0
1	1
2	4



12.  $2y-1 = \sqrt[3]{2x+1}$       Cuberoot

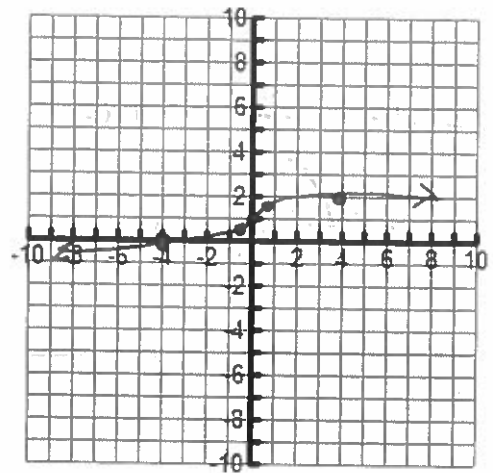
$2y = \sqrt[3]{2x+1} + 1$

$y = \frac{1}{2} \sqrt[3]{2x+1} + \frac{1}{2}$

Vertical shrink of  $\frac{1}{2}$  ( $\frac{1}{2}y$ )  
horizontal shrink of  $\frac{1}{2}$  ( $\frac{1}{2}x$ )

up 1

X	Y
-8	-2
-1	-1
0	0
1	1
8	2



13.  $y = \frac{1}{2} \sqrt[3]{x+2} - 3$

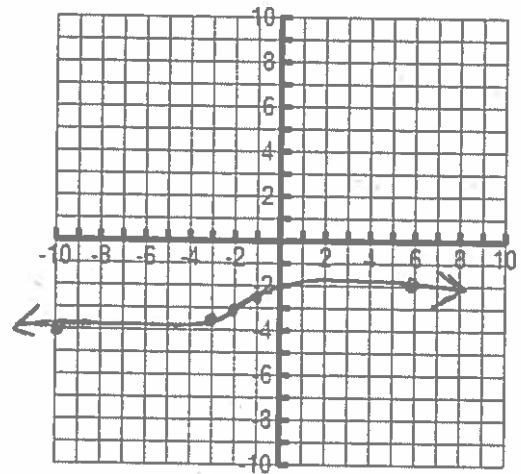
vertical shrink of  $\frac{1}{2}$  ( $\frac{1}{2}y$ )

left 2 ( $x-2$ )

down 3 ( $y-3$ )

Cuberoot

X	Y
-8	-2
-1	-1
0	0
1	1
8	2



14.  $y+4 = \frac{1}{2} \sqrt{-2x+5}$

$y = \frac{1}{2} \sqrt{-2x+5} - 4$

Vertical shrink of  $\frac{1}{2}$  ( $\frac{1}{2}y$ )

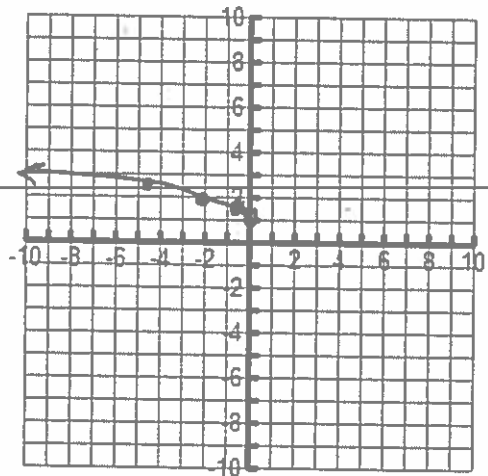
reflect over y axis ( $-x$ )

horizontal shrink of  $\frac{1}{2}$  ( $\frac{1}{2}x$ )

up 1 ( $y+1$ )

Square Root

X	Y
0	0
1	1
4	2
9	3



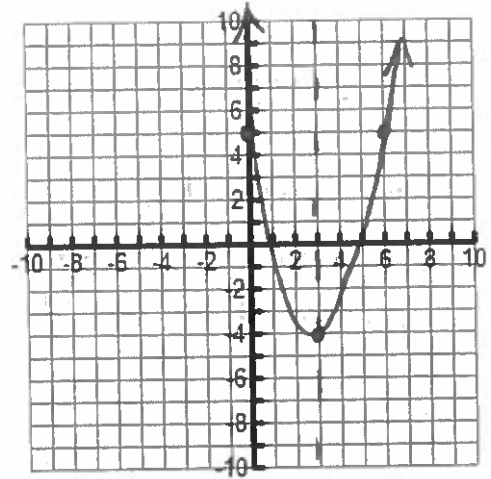
15.  $y = x^2 - 6x + 5$

$x = \frac{-b}{2a} = \frac{-(-6)}{2(1)} = 3$  x=3 AOS

$y = (3)^2 - 6(3) + 5$  (3, -4) vertex

$y = -4$

y-int: (0, 5)



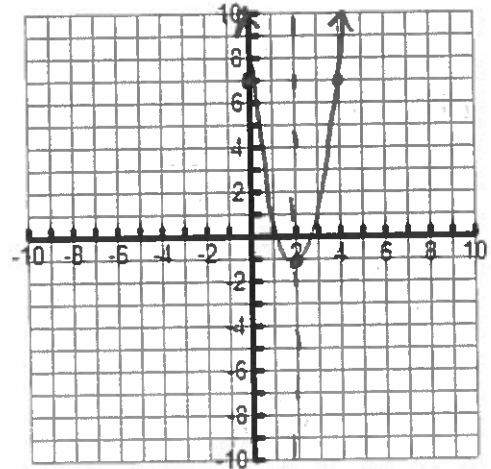
16.  $y = 2x^2 - 8x + 7$

$x = \frac{-b}{2a} = \frac{-(-8)}{2(2)} = 2$  x=2 AOS

$y = 2(2)^2 - 8(2) + 7$  (2, -1) vertex

$y = -1$

y-int: (0, 7)

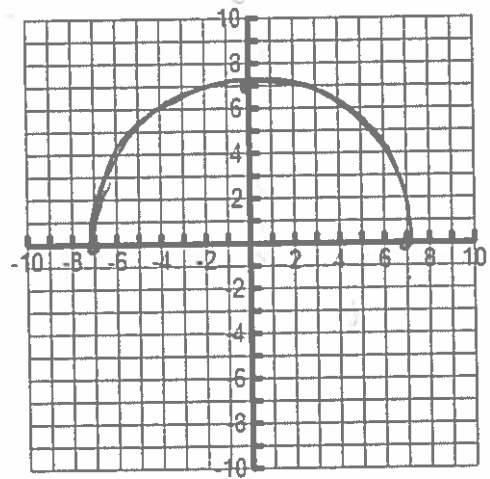


17.  $y = \sqrt{49 - x^2}$

↑  
 $r^2$

$r = 7$

Semicircle



18.  $y - 3 = -2(x + 1)^2$

$y = -2(x + 1)^2 + 3$

reflect over x-axis (-y)

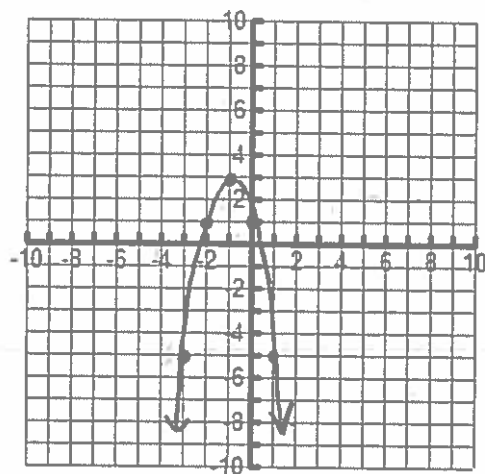
vertical stretch of 2 (2y)

left 1 (x-1)

up 3 (y+3)

Quadratic

X	Y
-2	4
-1	1
0	0
1	1
2	4



**SYMMETRY:** Test the following equations for symmetry. Which of the following are functions?

19.  $|y| = 7x^5 + x$

x-axis:  $|y| = 7x^5 + x$ , yes

y-axis:  $|y| = 7(-x)^5 + (-x)$ , no

origin:  $|y| = 7(-x)^5 + (-x)$ , no

x-axis, neither even nor odd, not a function

20.  $3x^2 + 6y^4 = 9$

x-axis:  $3x^2 + 6(-y)^4 = 9$ , yes

y-axis:  $3(-x)^2 + 6y^4 = 9$ , yes

origin:  $3(-x)^2 + 6(-y)^4 = 9$ , yes

x-axis, y-axis, and origin neither even nor odd, not a function

21.  $xy = x + 4y^3$

x-axis:  $x(-y) = x + 4(-y)^3$ , no

y-axis:  $(-x)y = (-x) + 4y^3$ , no

origin:  $(-x)(-y) = (-x) + 4(-y)^3$ , no

no symmetry, neither even nor odd, function

22.  $8x + 3y^2 = 0$

x-axis:  $8x + 3(-y)^2 = 0$ , yes

y-axis:  $8(-x) + 3y^2 = 0$ , no

origin:  $8(-x) + 3(-y)^2 = 0$ , no

x-axis, neither even nor odd, not a function

23.  $y = 4x^2 - 7$

x-axis:  $(-y) = 4x^2 - 7$ , no

y-axis:  $y = 4(-x)^2 - 7$ , yes

origin:  $(-y) = 4(-x)^2 - 7$ , no

y-axis, even function

24.  $3x - 4y = 8x^3$

x-axis:  $3x - 4(-y) = 8x^3$ , no

y-axis:  $3(-x) - 4y = 8(-x)^3$ , no

origin:  $3(-x) - 4(-y) = 8(-x)^3$ , yes

origin symmetry, odd function

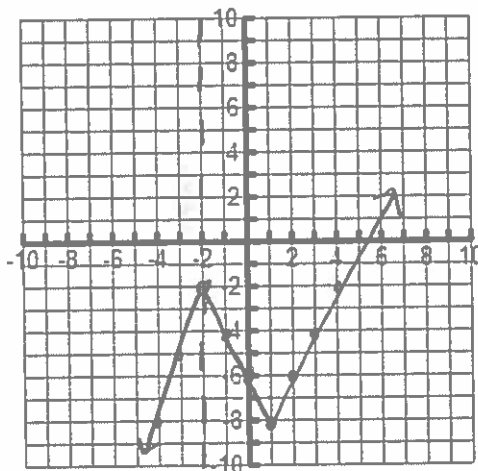
**PIECEWISE FUNCTIONS:** Graph the following piecewise functions on a coordinate plane. Which of the piecewise functions below are continuous?

25.  $f(x) = \begin{cases} 3x + 4, & x < -2 \\ 2|x - 1| - 8, & x \geq -2 \end{cases}$

abs. value

x	y	vertical stretch of 2
-2	2	right 1
-1	1	down 8
0	0	
1	1	
2	2	

D:  $(-\infty, \infty)$   
R:  $(-\infty, \infty)$   
Continuous

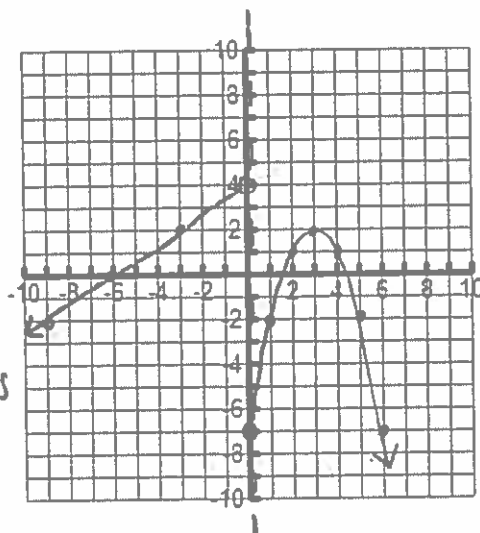


26.  $f(x) = \begin{cases} \frac{2}{3}x + 4, & x < 0 \\ -(x - 3)^2 + 2, & x \geq 0 \end{cases}$

Quadratic

x	y	reflect over x-axis
-2	4	right 3
-1	1	up 2
0	0	
1	1	
2	4	

D:  $(-\infty, \infty)$   
R:  $(-\infty, 4)$   
Not continuous



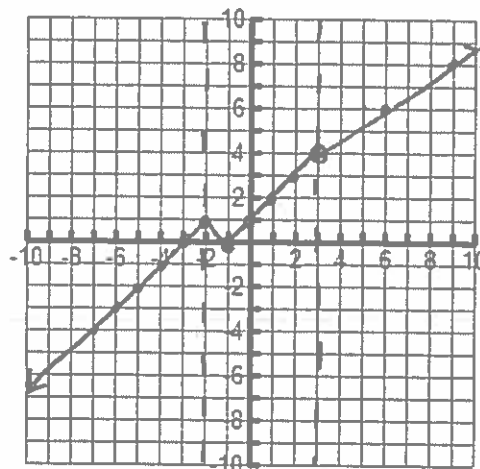


$$27. f(x) = \begin{cases} x+3, & x \leq -2 \\ |x+1|, & -2 < x < 3 \\ \frac{2}{3}x+2, & x \geq 3 \end{cases}$$

abs value

x	y
-2	2
-1	1
0	0
1	1
2	2

D:  $(-\infty, \infty)$   
 R:  $(-\infty, \infty)$   
 Continuous



$$28. f(x) = \begin{cases} |x+5|, & x < -1 \\ x^2 - 2x + 1, & x \geq -1 \end{cases}$$

abs. value

x	y
-2	2
-1	1
0	0
1	1
2	2

D:  $(-\infty, \infty)$   
 R:  $[0, \infty)$   
 Continuous

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

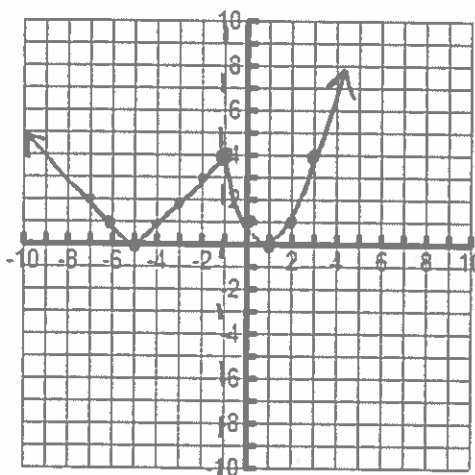
$$y = (1)^2 - 2(1) + 1 = 0$$

(1, 0)  
vertex

y-int (0, 1)

$$x = -1 \\ (-1)^2 - 2(-1) + 1 = 4$$

(-1, 4) ← another point



EVEN AND ODD FUNCTIONS: Determine if the following functions are even, odd, or neither.

29.  $f(x) = 7x^5 - 4x^3 + 1$

x-axis:  $(-y) = 7x^5 - 4x^3 + 1$ , no

y-axis:  $y = 7(-x)^5 - 4(-x)^3 + 1$ , no

origin:  $(-y) = 7(-x)^5 - 4(-x)^3 + 1$ , no

No symmetry, neither even nor odd

30.  $f(x) = 9x^6 - 5x^2$

x-axis:  $(-y) = 9x^6 - 5x^2$ , no

y-axis:  $y = 9(-x)^6 - 5(-x)^2$ , yes

origin:  $(-y) = 9(-x)^6 - 5(-x)^2$ , no

y-axis symmetry, even function

31.  $f(x) = 8x^3 - \frac{1}{x}$

x-axis:  $(-y) = 8x^3 - \frac{1}{x}$ , no

y-axis:  $y = 8(-x)^3 - \frac{1}{(-x)}$ , no

origin:  $(-y) = 8(-x)^3 - \frac{1}{(-x)}$ , yes

origin symmetry,  
odd function

33.  $y = 7x^4 - 9x^2 + 1$

x-axis:  $(-y) = 7x^4 - 9x^2 + 1$ , no

y-axis:  $y = 7(-x)^4 - 9(-x)^2 + 1$ , yes

origin:  $(-y) = 7(-x)^4 - 9(-x)^2 + 1$ , no

y-axis symmetry,  
even function

32.  $y = 3x^3 + 2x^2 - 7x + 1$

x-axis:  $(-y) = 3x^3 + 2x^2 - 7x + 1$ , no

y-axis:  $y = 3(-x)^3 + 2(-x)^2 - 7(-x) + 1$ , no

origin:  $-y = 3(-x)^3 + 2(-x)^2 - 7(-x) + 1$ , no

no symmetry,  
neither even nor odd

34.  $f(x) = 6x^3 - 9x + 5$

x-axis:  $(-y) = 6x^3 - 9x + 5$ , no

y-axis:  $y = 6(-x)^3 - 9(-x) + 5$ , no

origin:  $(-y) = 6(-x)^3 - 9(-x) + 5$ , no

no symmetry,  
neither even nor odd

DOMAIN OF FUNCTIONS: Identify the domain of the following functions.

35.  $f(x) = \frac{2x-3}{x^2-2x-24}$

$x^2 - 2x - 24 = 0$     D:  $(-\infty, 4) \cup (4, 6) \cup (6, \infty)$

$(x-6)(x+4) = 0$

$x \neq 6, 4$  

36.  $f(x) = 3x^3 + 2x^2 - 7x + 1$

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

37.  $f(x) = \sqrt{x^2 - 9x + 14}$

$x^2 - 9x + 14 = 0$     D:  $(-\infty, 2] \cup [7, \infty)$

$(x-7)(x-2) = 0$

$x = 7, 2$



39.  $f(x) = \frac{\sqrt{x}}{x^2-16}$     D:  $[0, 4) \cup (4, \infty)$

$x \geq 0$

$x \neq \pm 4$



38.  $f(x) = \frac{2}{x^2-6x+5}$

$x^2 - 6x + 5 = 0$     D:  $(-\infty, 1) \cup (1, 5) \cup (5, \infty)$

$(x-5)(x-1) = 0$

$x = 5, 1$



40.  $f(x) = \frac{2}{\sqrt{x+3}}$

$x+3 > 0$

$x > -3$

D:  $(-3, \infty)$



41. The monthly revenue  $R$  achieved by selling  $x$  wristwatches is figured to be  $R(x) = 100x - 0.1x^2$ . The monthly cost  $C$  of selling  $x$  wristwatches is  $C(x) = 35x + 1500$ . Profit is given by the function  $P(x) = R(x) - C(x)$ . How many watches must be sold to maximize profit? What is the maximum profit?

$$P(x) = (100x - 0.1x^2) - (35x + 1500)$$

$$100x - 0.1x^2 - 35x - 1500$$

$$P(x) = -0.1x^2 + 65x - 1500 \quad P(325) = -0.1(325)^2 + 65(325) - 1500$$

$$x = \frac{-b}{2a} = \frac{-65}{2(-.1)} = 325 \quad P(325) = 9062.5$$

325 watches should be sold to reach to reach a maximum profit of \$9062.50

INTERCEPTS: Identify the  $x$  and  $y$ -intercept(s) for each equation.

42.  $y = \frac{-x^3}{x^2 - 9}$

x-int:  $0 = \frac{-x^3}{x^2 - 9}$   
 $0 \rightarrow y$

$$0 = -x^3$$

$$0 = x^3$$

$$0 = x$$

$$(0, 0)$$

y-int:  $y = \frac{-0^3}{0^2 - 9} = \frac{0}{-9} = 0$   
 $0 \rightarrow x$

$$(0, 0)$$

43.  $y = \frac{x^4 + 1}{2x^5}$

x-int:  $0 = \frac{x^4 + 1}{2x^5}$   
 $0 \rightarrow y$

$$0 = x^4 + 1$$

$$\sqrt[4]{-1} = \sqrt[4]{x^4}$$

No solution

No x-int

y-int:  $y = \frac{0^4 + 1}{2(0)^5} = \frac{1}{0} = \text{undefined}$   
 $0 \rightarrow x$

No y-int

44.  $y = 2|x - 3| - 6$

x-int:  $0 = 2|x - 3| - 6$

$$0 \rightarrow y \quad 6 = 2|x - 3|$$

$$3 = |x - 3|$$

$$3 = x - 3 \quad -3 = x - 3$$

$$6 = x$$

$$0 = x$$

$$(6, 0) \text{ and } (0, 0)$$

y-int:  $y = 2|0 - 3| - 6$   
 $0 \rightarrow x$

$$2|-3| - 6$$

$$2(3) - 6$$

$$6 - 6$$

$$0$$

$$(0, 0)$$

