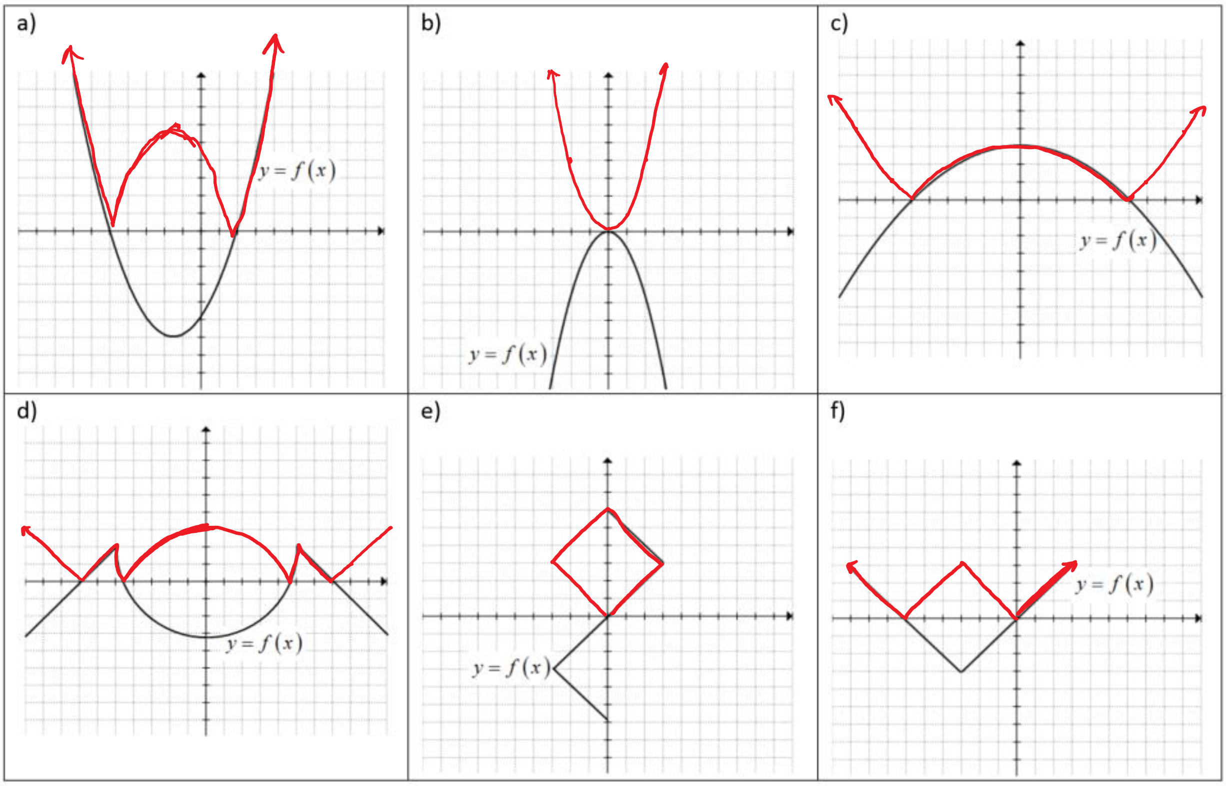
HW SOL 1.5a

November 9, 2017 8:25 PM

Name:______________________________ Date:____________________________

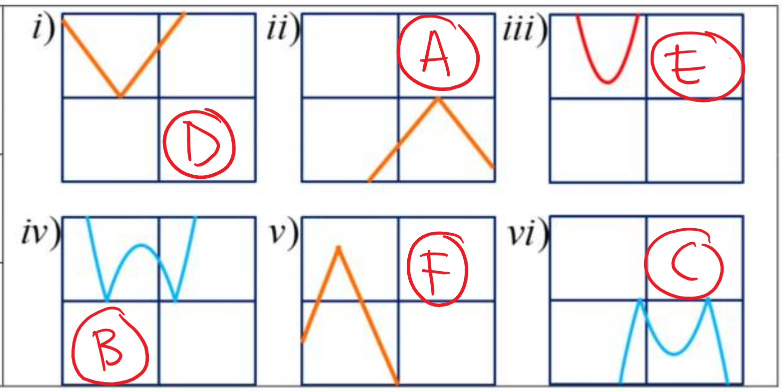
Section 1.5 Absolute Value and Inverse of Quadratic Functions

1. Graph $y=|f(x)|$ for each function on the same grid:



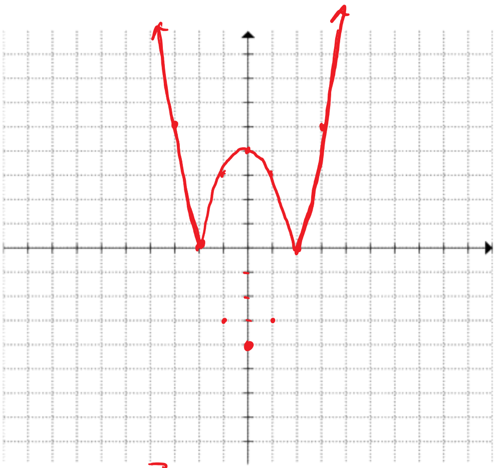
2. Given each equation on the right, indicate which of the graphs on the right is the corresponding one:

a) $y=-\lvert -3x+7\rvert$ · opens down · linear ii	b) $y=\lvert (x+3)^2-4\rvert$ · quadratic
c) $y=-\lvert (x-3)^2-5\rvert$ · opens down	d) $y=\lvert 3x+7\rvert$ · linear i
e) $y=\lvert (x+3)^2+1\rvert$ iii	f) $y=-\lvert -5x-8\rvert+4$ v



3. Graph each of the following functions on the grid provided. Get the Domain and Range, state the piece wise function:

a) $y = |x^2 - 4|$

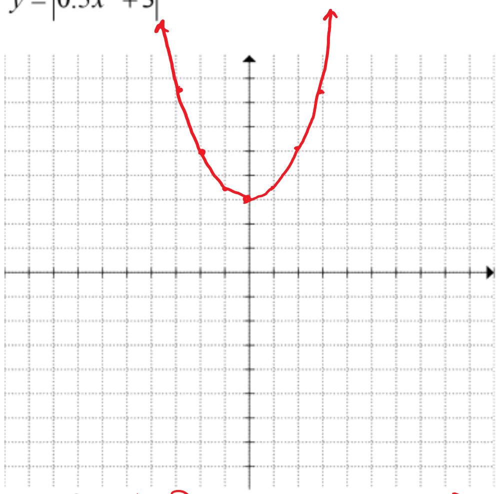


Domain $x \in \mathbb{R}$ Range: $y \geq 0$

Piece Wise Function:

$$y = \begin{cases} x^2 - 4 \ ; & x < -2 \\ -(x^2 - 4) \ ; & -2 \leq x < 2 \\ x^2 - 4 \ ; & x \geq 2 \end{cases}$$

$y = |0.5x^2 + 3|$

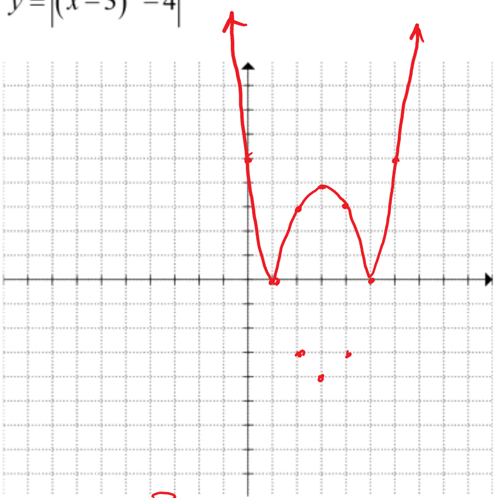


Domain $x \in \mathbb{R}$ Range: $y \geq 3$

Piece Wise Function:

$$y = \begin{cases} 0.5x^2 + 3 & x \in \mathbb{R} \end{cases}$$

$y = |(x-3)^2 - 4|$



Domain $x \in \mathbb{R}$ Range: $y \geq 0$

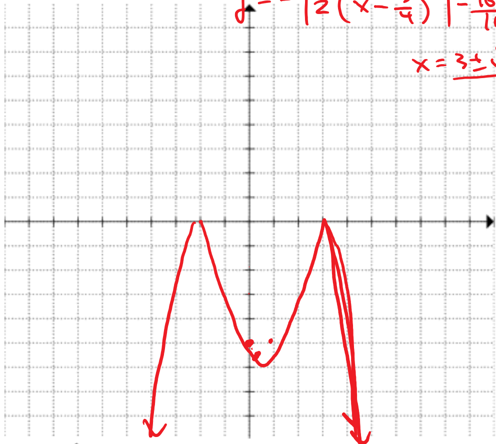
Piece Wise Function:

$$y = \begin{cases} (x-3)^2 - 4 \ ; & x < 1 \\ -(x^2 - 3)^2 + 4 \ ; & 1 \leq x < 5 \\ (x-3)^2 - 4 \ ; & 5 \leq x \end{cases}$$

$y = -|2x^2 - 3x - 10|$ $= -\left| 2\left(x^2 - \frac{3x}{2} + \frac{9}{16}\right) - 10 - \frac{9}{16} \right|$

$y = -\left|2\left(x - \frac{3}{4}\right)^2\right| - \frac{169}{16}$

$x = \frac{3 \pm \sqrt{9 + 4(2)(10)}}{4}$



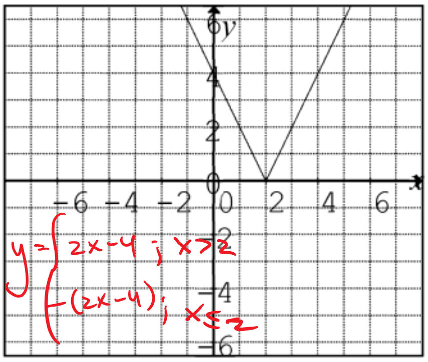
Domain Range:

Piece Wise Function:

$$y = \begin{cases} -(2x^2 - 3x - 10) \ ; & x < \frac{3 - \sqrt{89}}{4} \\ 2x^2 - 3x - 10 \ ; & \frac{3-\sqrt{89}}{4} < x \leq \frac{3+\sqrt{89}}{4} \\ -(2x^2 - 3x - 10) \ ; & x \geq \frac{3+\sqrt{89}}{4} \end{cases}$$

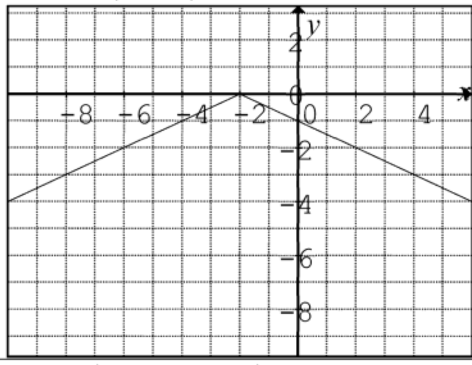
3. Write the piecewise function that represents each absolute value function.

a) $y=|2x-4|$

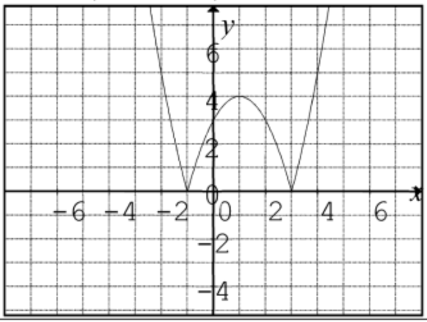


$y=\begin{cases} 2x-4 \ ; \ x\geq 2 \\ -(2x-4) \ ; \ x<2 \end{cases}$

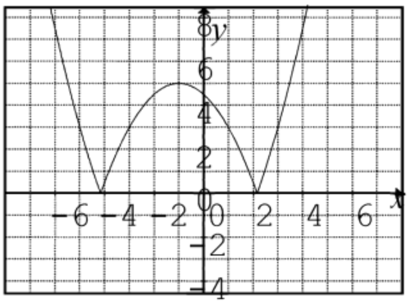
b) $y=-\left|\frac{1}{2}x+1\right|$



c) $y=|x^2-2x-3|$



d) $y=|0.5(x+1)^2-5|$



4. What is the difference between the graphs of $y=|3x+1|$ and $y=-|3x+1|$.

opens up

opens down.

5. What is the difference between the graphs of $y=|3x+1|$ and $y=|3x+1|+4$.

vertex $\left(-\frac{1}{3}, 0\right)$

vertex $\left(-\frac{1}{3}, 4\right)$

• shifted 4 units up.

6. The following points $(3,5)$, $(-3,-7)$, $(-2,8)$, $(7,-10)$, and $(-3,-9)$ are on the function $y=f(x)$.

What will the coordinates be on the function: $y=|f(x)|$?

$(3,5) \longrightarrow (3,5)$

$(-3,-7) \longrightarrow (-3,+7)$

$(-2,8) \longrightarrow (-2,8)$

$(7,-10) \longrightarrow (7,10)$

$(-3,-9) \longrightarrow (-3,9)$

Note: x coord doesn't change

y coord will become + ve

7. Solve each of the following:

a) $|x-3| = x-4$

$x-3 = x-4$

$-3 \neq -4$

No soln

$\therefore$ No soln

$x-3 = -(x-4)$

$x-3 = -x+4$

$2x = 7$

$\boxed{x = \frac{7}{2}}$

EXTRANEOUS

b) $|2x-3| = x+4$

$2x-3 = x+4$

$x = 7$ ✓

$2x-3 = -(x+4)$

$2x-3 = -x-4$

$3x = -1$

$x = -\frac{1}{3}$ ✓

c) $|x^2+9| = 6x$

$x^2+9 = 6x$

$x^2-6x+9 = 0$

$(x-3)(x-3) = 0$

$x = 3$ ✓

$x^2+9 = -6x$

$x^2+6x+9 = 0$

$(x+3)^2 = 0$

$x = -3$

EXTRANEOUS

d) $|2x^2-x-6| = 2x+1$

$2x^2-x-6 = 2x+1$

$2x^2-3x-7 = 0$

$x = \frac{3 \pm \sqrt{9+8(7)}}{4}$

$x = \frac{3 \pm \sqrt{65}}{4}$ (EXTR)

$x = \frac{3+\sqrt{65}}{4}$, $x \neq \frac{3-\sqrt{65}}{4}$

$2x^2-x-6 = -2x-1$

$2x^2+x-5 = 0$

$x = \frac{-1 \pm \sqrt{1+4(2)(5)}}{4}$

$x = \frac{-1 \pm \sqrt{41}}{4}$

$x = \frac{-1+\sqrt{41}}{4}$ ✓ ; $x \neq \frac{-1-\sqrt{41}}{4}$ EXTR

k) $|x^2+9| = 6x$

(CHANGE!)

l) $|2x^2-x-6| = 2x+1$

(CHANGE)

m) $12 = |x^2+3|$

$x^2+3 = 12$

$x^2 = 9$

$x = \pm 3$

$x^2+3 = -12$

$x^2 = -15$

(NO REAL VALUES)

n) $|x^2-10x| = 24$

$x^2-10x = 24$

$x^2-10x-24 = 0$

$(x-12)(x+2) = 0$

$x = 12$, $x = -2$

$x^2-10x = -24$

$x^2-10x+24 = 0$

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

$x = 6$, $x = 4$

O) $|13x - x^2| = 30$

$13x - x^2 = 30$

$0 = x^2 - 13x + 30$

$0 = (x-10)(x-3)$

$x = 10 \quad x = 3$

$13x - x^2 = -30$

$0 = x^2 - 13x - 30$

$0 = (x-15)(x+2)$

$x = 15 \quad x = -2$

P) $|x^2 - 3x| = 4$

$x^2 - 3x = 4$

$x^2 - 3x - 4 = 0$

$(x-4)(x+1) = 0$

$x = 4 \quad x = -1$

$x^2 - 3x = -4$

$x^2 - 3x + 4 = 0$

$x = \frac{3 \pm \sqrt{9 - 4(4)}}{2}$

No REAL Soln

8. Find all the value(s) of "x" for which the equation is true: $|x| = |x+1|$

① $(x) = (x+1)$
$0 \neq 1$
(No soln)

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

③ $-x = -(x+1)$
$-x = -x - 1$
$0 = -1$
(No soln)

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

9. If $f(3) = -5$ and $f(-5) = 7$, then what is the value of $|f(-5)| - f^{-1}(-5)$?

① $f(3) = -5$
$(3, -5)$

② $f(-5) = 7$
$(-5, 7)$

③ $f^{-1}(-5) = 3$.

④ $|f(-5)| - f^{-1}(-5)$
$= |7| - 3$
$= 4$

10. Find the two value(s) that will satisfy the equation: $|x-1| + |x| + |x+1| = \frac{5}{2}$

NOTE: EACH ABS VALUE CAN BE EITHER +'ve or −'ve.

So 8 CASES!

① + + +
② + + −
③ + − +
④ − + +
⑤ − − −
⑥ − − +
⑦ − + −
⑧ + − −

only 2 work

⑥ $-(x-1) - (x) + (x+1) = \frac{5}{2}$
$-x + 1 - \cancel{x} + \cancel{x} + 1 = \frac{5}{2}$
$-x + 2 = \frac{5}{2}$
$-x = \frac{1}{2}$
$x = -\frac{1}{2}$

check:
$|-\frac{1}{2} - 1| + |-\frac{1}{2}| + |-\frac{1}{2} + 1| = \frac{5}{2}$
$|-\frac{3}{2}| + |\frac{1}{2}| + |\frac{1}{2}|$ ✓
$\frac{3}{2} + \frac{1}{2} + \frac{1}{2} = \frac{5}{2}$

② − + +
$-(x-1) + x + x + 1 = \frac{5}{2}$
$-\cancel{x} + 1 + \cancel{x} + x + 1 = \frac{5}{2}$
$x + 2 = \frac{5}{2}$
$x = \frac{1}{2}$

check:
$|\frac{1}{2} + 1| + |\frac{1}{2}| + |\frac{1}{2} - 1| = \frac{5}{2}$
$\frac{3}{2} + \frac{1}{2} + \frac{1}{2} = \frac{5}{2}$ ✓

11. Solve for "x" $\left|x^2-9x+20\right|=\left|16-x^2\right|$

① ++

$x^2-9x+20 = 16-x^2$ ②

$2x^2-9x+4=0$

$\begin{array}{cc} 2 & -4 \\ 1 & -1 \end{array}$

$(2x-1)(x-4)=0$

$\boxed{x=\frac{1}{2} \quad x=4.}$

Check:

$\frac{1}{2}^2-9\left(\frac{1}{2}\right)+20 = 16-\left(\frac{1}{2}\right)^2$

$\frac{1}{4}-\frac{9}{2}+20 = 16-\frac{1}{4}$

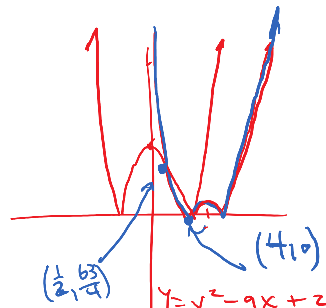
$\frac{80}{4}-\frac{18}{4}+\frac{1}{4} = \frac{64}{4}-\frac{1}{4}$ ✓

check

$4^2-9(4)+20 = 16-16$

$16-36+20=0$

$0=0$ ✓



$y=x^2-9x+20$

$y=\left(x^2-9x+\frac{81}{4}\right)-\frac{81}{4}+\frac{80}{4}$

$y=(x-4.5)^2-0.25$

12. How many ordered pairs of integers (a,b) satisfy this equation? $|a-2|\times|b-3|=2$

$|a-2|\times|b-3|=2$

8 cases

	a	b	
1×2	3	5	→ (3,5)
1×-2	3	1	→ (3,1)
-1×2	1	5	→ (1,5)
-1×-2	1	1	→ (1,1)
2×1	4	4	→ (4,4)
2×-1	4	2	→ (4,2)
-2×1	0	4	→ (0,4)
-2×-1	0	2	→ (0,2)

13. The parabola with equation $y=ax^2+bx+c$ and vertex (h,k) is reflected about the line $y=k$. This results in the parabola with equation $y=dx^2+cx+f$. What is the value of $a+b+c+d+e+f$?

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(A) $2b$ **(B)** $2c$ **(C)** $2a + 2b$ **(D)** $2h$ **(E)** $2k$

19. A parabola with equation $y = ax^2 + bx + c$ is reflected about the x-axis. The parabola and its reflection are translated horizontally five units in opposite directions to become the graphs of $y = f(x)$ and $y = g(x)$, respectively. Which of the following describes the graph of $y = (f + g)(x)$?

(A) a parabola tangent to the x-axis

(B) a parabola not tangent to the x-axis **(C)** a horizontal line

(D) a non-horizontal line **(E)** the graph of a cubic function

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