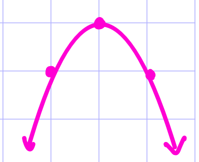
Do Now: From yesterday's packet #9

For each of the following, find the axis of symmetry, vertex, x- and y-intercepts and sketch the graph on a separate piece of graph paper.

$f(x) = a(x-h)^2 + k$

9. $f(x) = -x^2 + 8x$

maximum



$f(x) = -(x^2 - 8x + 16 - 16)$

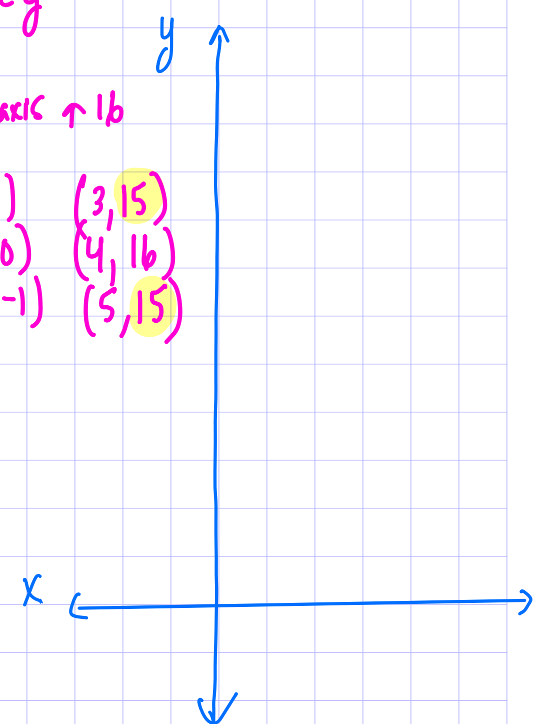
$f(x) = -(x-4)^2 - (-16)$

$f(x) = -(x-4)^2 + 16$

x^2	right 4	negate y ↓ reflect over x-axis	↑16
(-1, 1)	(3, 1)	(3, -1)	(3, 15)
(0, 0)	(4, 0)	(4, 0)	(4, 16)
(1, 1)	(5, 1)	(5, -1)	(5, 15)

vertex: (4, 16)

axis of symmetry: $x = 4$



x-int: (let $y = 0$)

$0 = -(x-4)^2 + 16$

$-16 = -(x-4)^2$

$16 = (x-4)^2$

$\pm\sqrt{16} = x - 4$

$\pm 4 = x - 4$

$4 = x - 4$ $\quad$ $-4 = x - 4$

$8 = x$ $\quad$ $0 = x$

(8, 0), (0, 0)

y-int (let $x = 0$)

$y = -(0-4)^2 + 16$

$y = -16 + 16$

0

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

R: $(-\infty, 16]$

yint: (0, 0)

Continuing in yesterday's packet…

$y=a(x-h)^2+k$

∪

↑

minimum

10. $y=4x^2-8x+3$

$-\frac{1}{4}$

$y=4(\underbrace{x^2-2x+1}-1+\frac{3}{4})$

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

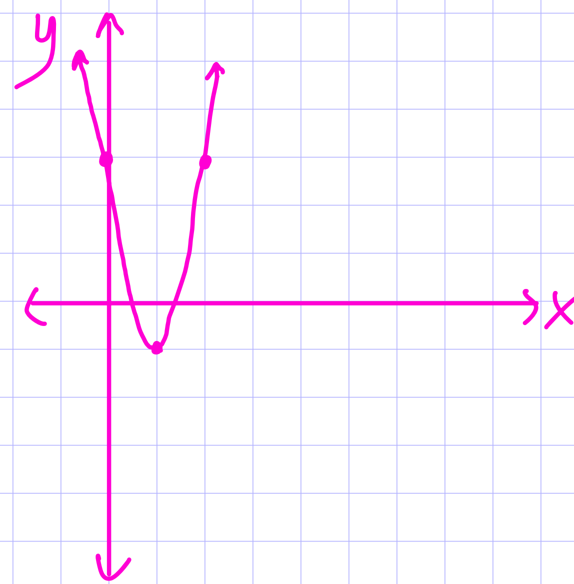
$y=4(x-1)^2-1$

v: $(1,-1)$

a of s: $x=1$

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

R: $[-1,\infty)$



x-int (let $y=0$)

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

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

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

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

$\pm\frac{1}{2}=x-1$

$\frac{1}{2}=x-1$ $\quad$ $-\frac{1}{2}=x-1$

$1\frac{1}{2}=x$ $\quad$ $\frac{1}{2}=x$

$(1\frac{1}{2},0)$, $(\frac{1}{2},0)$

y-int (let $x=0$)

$y=4(0-1)^2-1$

$y=3$

$(0,3)$

(multiply y's by 4)

x^2	right one	vertical stretch by 4	↓1
$(-1,1)$	$(0,1)$	$(0,4)$	$(0,3)$
$(0,0)$	$(1,0)$	$(1,0)$	$(1,-1)$
$(1,1)$	$(2,1)$	$(2,4)$	$(2,3)$

Name: ______________________________ Date: _________
PC: Vertex Form Practice Ms. Loughran

Put each of the following quadratics in vertex form, make a graph of each and then find all of the following for each:

(a) the vertex
(b) the axis of symmetry
(c) the x-intercepts, if any
(d) the y-intercepts
(e) the domain
(f) the range

1. $y = x^2 - 2x - 4$

$y = \underbrace{x^2 - 2x + 1}\ -1\ -4$

$y = (x-1)^2 - 5$

U

↑ minimum

V: $(1, -5)$

a of s: $x = 1$

x-int ($y \overset{\text{let}}{=} 0$)

$0 = (x-1)^2 - 5$

$5 = (x-1)^2$

$\pm\sqrt{5} = x - 1$

$1 \pm \sqrt{5} = x$

$(1 \pm \sqrt{5}, 0)$

y-int ($x \overset{\text{let}}{=} 0$)

$y = (0-1)^2 - 5$

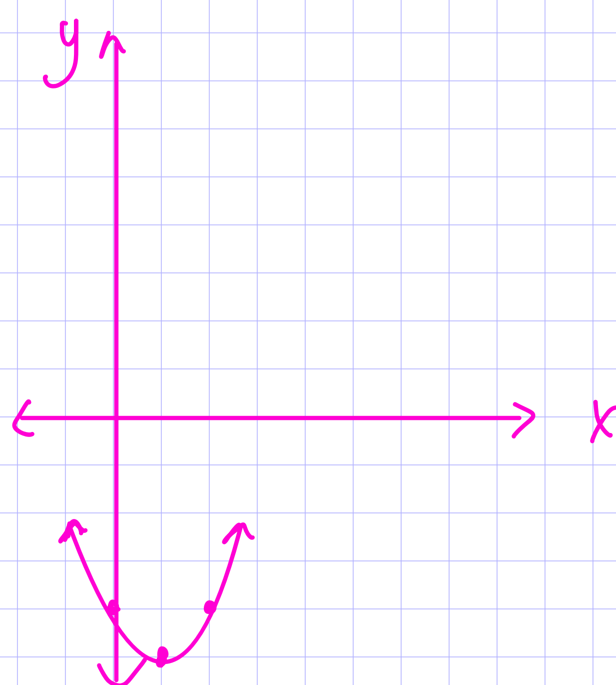
$y = 1 - 5$

$y = -4$

$(0, -4)$

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

R: $[-5, \infty)$



x^2	right 1	↓5
$(-1, 1)$	$(0, 1)$	$(0, -4)$
$(0, 0)$	$(1, 0)$	$(1, -5)$
$(1, 1)$	$(2, 1)$	$(2, -4)$

Homework 10-26

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

$y = x^2 - 6x + 9 - 9 + 5$
$y = (x-3)^2 - 4$

(e) $y = x^2 - 2x - 5$

$y = x^2 - 2x + 1 - 1 - 5$
$y = (x-1)^2 - 6$

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

$y = x^2 + 4x + 4 - 4$
$y = (x+2)^2 - 4$

6 V: $(5,-4)$ D: $(-\infty,\infty)$
a of s: $x=5$ R: $[-4,\infty)$
y-int: $(0,21)$
x-int: $(7,0),(3,0)$

7 $f(x) = (x+3)^2 - 4$
V: $(-3,-4)$
a of s: $x=-3$
y int: $(0,5)$
x-int: $(-1,0),(-5,0)$
D: $(-\infty,\infty)$
R: $[-4,\infty)$

8 $y = (x+2)^2 + 1$
V: $(-2,1)$
a of s: $x=-2$
y-int: $(0,5)$
x-int: none
D: $(-\infty,\infty)$
R: $[1,\infty)$

11 $y = (x-3)^2 + 4$
V: $(3,4)$ D: $(-\infty,\infty)$
a of s: $x=3$ R: $[4,\infty)$
y-int. $(0,13)$
x-int. none

① Simplify and state restrictions:

$$\frac{a^{-2}-16b^{-2}}{a^{-2}-(ab)^{-1}-12b^{-2}}$$

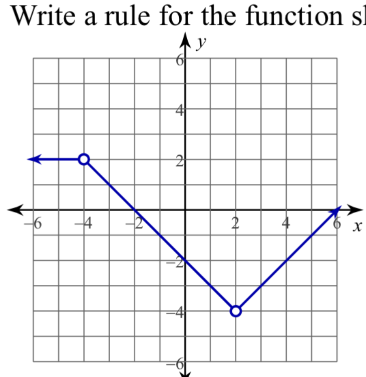
$$\frac{\frac{1}{\cancel{a^2}} - \frac{16\,a^2\cancel{b^2}}{\cancel{b^2}}}{\frac{1}{\cancel{a^2}} - \frac{1\,\cancel{a^2}b^{\cancel{2}}}{\cancel{ab}} - \frac{12\,a^2\cancel{b^2}}{\cancel{b^2}}} \quad a^2b^2$$

$a,b \neq 0$

$b \neq 4a, -3a$

$$\frac{b^2-16a^2}{b^2-ab-12a^2} = \frac{\cancel{(b-4a)}(b+4a)}{\cancel{(b-4a)}(b+3a)} = \frac{b+4a}{b+3a}$$

③ Write a rule for the function shown.



$$f(x)=\begin{cases} 2 & x<-4 \\ -x-2 & -4<x<2 \\ x-6 & x>2 \end{cases}$$

$\{x \mid x\in\mathbb{R}, x\neq -4, 2\}$

D: $x \neq -4, 2$

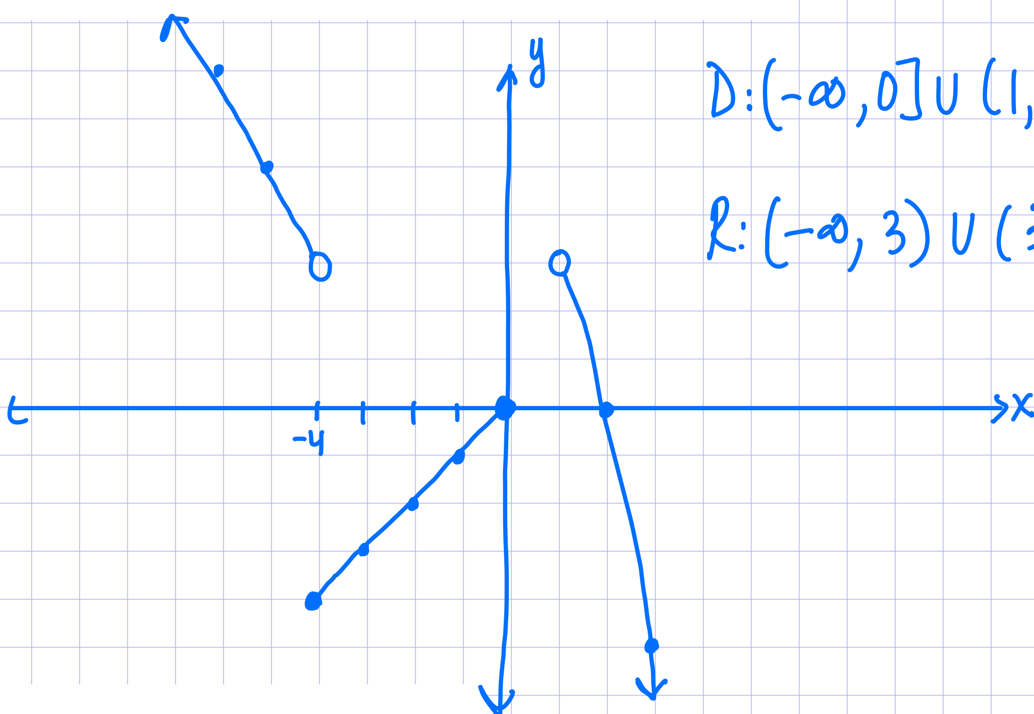
$(-\infty,-4)\cup(-4,2)\cup(2,\infty)$

R: $(-4,\infty)$

$\{y \mid y>-4\}$

② Graph the piecewise function and state its domain and range:

$$f(x) = \begin{cases} -2x-5 & x<-4 \\ -|x| & -4 \le x \le 0 \\ 4-x^2 & x>1 \end{cases}$$

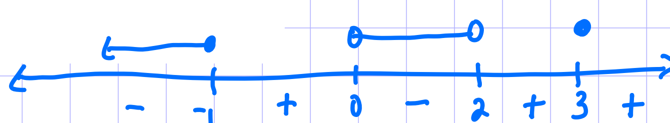


D: $(-\infty, 0] \cup (1, \infty)$

R: $(-\infty, 3) \cup (3, \infty)$

④ Solve and express the solution set in interval notation:

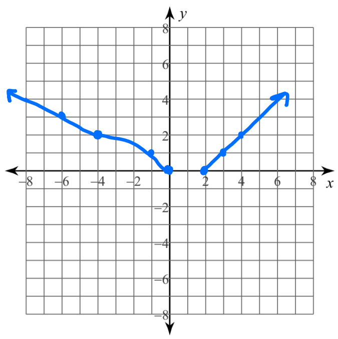
$$\frac{\overset{+}{(x-3)^2}\overset{+}{(x+1)}}{\underset{+}{x}\underset{-}{(x-2)}} \le 0$$



$(-\infty, -1] \cup (0, 2) \cup \{3\}$

5

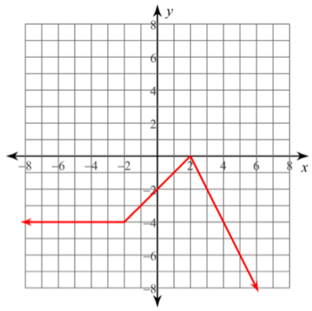
$$w(x)=\begin{cases}\dfrac{|x|}{2}, & x \le -4\\ \sqrt{-x}, & -4 < x < 2\\ |x-2|, & x \ge 2\end{cases}$$



D: $(-\infty, 0] \cup [2, \infty)$

R: $[0, \infty)$

⑥ Write an equation for the graphed function.



$$f(x)=\begin{cases} -2x+4 & x \geq 2 \\ x-2 & -2 < x < 2 \\ -4 & x \leq -2 \end{cases}$$

Homework 10-29

Name: ___________________________________ Date: ________
PCH: Decomposition Practice Ms. Loughran

1. If $g(x) = -9x + 3$, find $f(x)$ so that $(g \circ f)(x) = -9x^4 + 3$.

   $f(x) = x^4$

2. If $g(x) = 3x$, find $f(x)$ so that $(g \circ f)(x) = 3x^2 + 3$.

   $f(x) = x^2 + 1$

3. If $f(x) = x^2 + 1$, find $g(x)$ so that $(f \circ g)(x) = 4x^2 - 4x + 2$.

   $g(x) = 2x - 1$

4. If $f(x) = -3x + 7$, find $g(x)$ so that $(f \circ g)(x) = -6x^2 + 31$.

   $g(x) = 2x^2 - 8$

5. If $f(x) = 2x - 5$, find $g(x)$ so that $(f \circ g)(x) = 2x - 1$.

$g(x) = x+2$

6. If $f(x) = x^2 + 7$, find $g(x)$ so that $(f \circ g)(x) = x^2 - 6x + 16$.

$g(x) = x-3$

7. If $f(x) = x^2$, find $g(x)$ so that $(f \circ g)(x) = 16x^2 - 24x + 9$.

$g(x) = 4x-3$

8. If $f(x) = \sqrt{x-8}$, find $g(x)$ so that $(f \circ g)(x) = \sqrt{-4x-6}$.

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