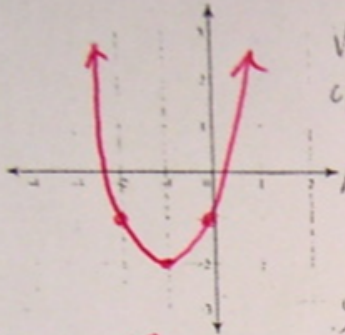


HOMWORK Solutions...

Sketch the graph of each function.

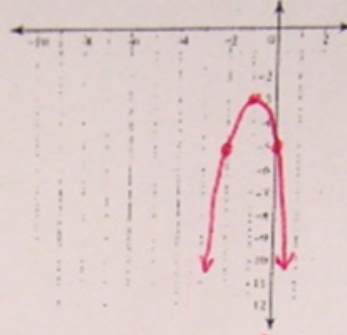
1) $y = (x+1)^2 - 2$



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

Vertex $(-1, -2)$
 opening up or down
 Range $\{y \geq -2\}$
 y-intercept $(0, -1)$
 max or min
 y-value = -2

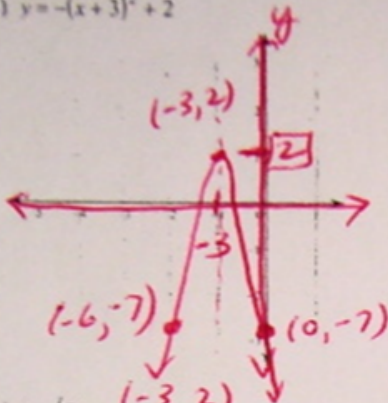
2) $y = -2(x+1)^2 - 3$



$y = -2(0+1)^2 - 3$
 $y = -2(1) - 3$
 $y = -5$

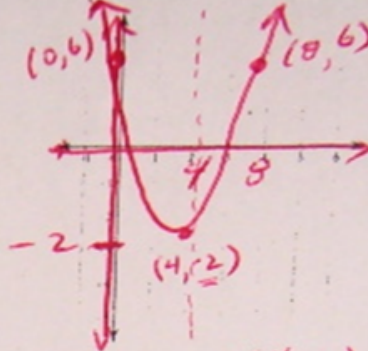
Vertex $(-1, -3)$
 opening up or down
 Range $\{y \leq -3\}$
 y-intercept $(0, -5)$
max or min
 y-value = -3

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



Vertex $(-3, 2)$
 opening down
 Range $\{y \leq 2\}$
 y-int $(0, -7)$
max/min y-value = 2
 $y = -(0+3)^2 + 2$
 $y = -9 + 2$
 $y = -7$

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



Vertex $(4, -2)$
 opening up
 Range $\{y \geq -2\}$
 y-int $(0, 6)$
max/min y-value = -2
 y-int...
 $y = \frac{1}{2}(0-4)^2 - 2$
 $y = \frac{1}{2}(16) - 2$
 $y = 8 - 2$
 $y = 6$

4) $y = \frac{1}{2}(x-4)^2 - 2$ ← vertex form $y = a(x-h)^2 + k$

$a = \frac{1}{2}$ (open up)
 2 (SF = $\frac{1}{2}$ wider)

$h = 4$ (right 4)
 $k = -2$ (down 2)

✓ Vertex $(4, -2)$

y-int

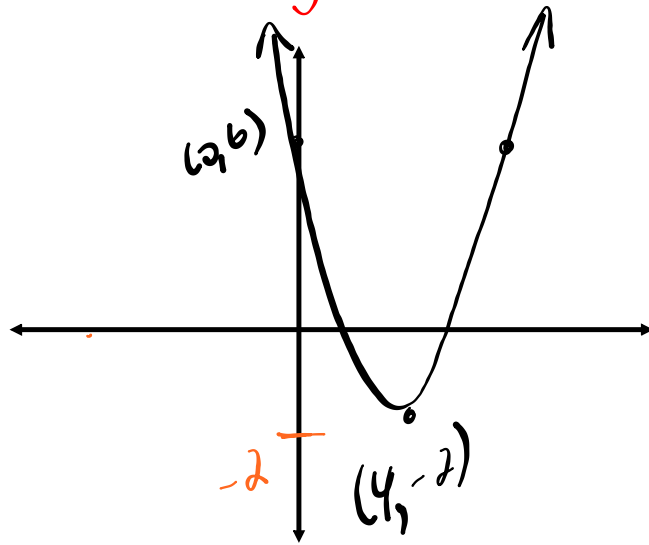
$y = \frac{1}{2}(0-4)^2 - 2$

$y = \frac{1}{2}(16) - 2$

$y = 8 - 2$

$y = 6$ ✓ $(0, 6)$

$R: \{y \geq -2\}$



HOMEWORK Solutions...

Remember:

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

$y = \frac{1}{4}(x-2)^2 + 6$
$y = -(x-5)^2 - 3$
$y = 9(x-\frac{1}{2})^2 + 10$
$y = -2(x+3)^2 + 4$
$y = 5(x-1)^2$
$y = 4x^2 + 6$
$y = (x-3)^2 - 17$
$y = x^2 - 5$
$y = \frac{1}{4}(x+2)^2 + 1$
$y = -4.9(x-1.5)^2 + 40.2$
$y = x^2$
$y = (x-2)^2$
$y = -3(x+5)^2 - 4$
$y = \frac{1}{2}(x-8)^2 + 7$

Standard form

$$y = ax^2 + bx + c$$

(Note: 'c' is circled in red with an arrow pointing to it)

$y = \frac{3}{4}x^2 - 3x + 9$
$y = -x^2 + 10x - 28$
$y = 9x^2 - 9x + 10.25$
$y = -2x^2 - 12x - 14$
$y = 5x^2 - 10x + 5$
$y = 4x^2 + 6$
$y = x^2 - 6x - 8$
$y = x^2 - 5$
$y = \frac{3}{4}x^2 + 3x + 4$
$y = -4.9x^2 + 14.7x + 29.175$
$y = x^2$
$y = x^2 - 4x + 4$
$y = -3x^2 - 30x - 79$
$y = \frac{1}{2}x^2 - 8x + 39$

$$y = -4.9(x - 1.5)^2 + 40.2$$

$$y = -4.9(x^2 - 3x + 2.25) + 40.2$$

$$y = -4.9x^2 + 14.7x - 11.025 + 40.2$$

$$y = -4.9x^2 + 14.7x + 29.175$$

$$y = 9\left(x - \frac{1}{2}\right)^2 + 10$$

$$y = 9\left(x^2 - x + \frac{1}{4}\right) + 10$$

$$y = 9x^2 - 9x + \frac{9}{4} + \frac{10 \cdot 4}{4}$$

$$y = 9x^2 - 9x + \frac{49}{4}$$

vertex form

factor \uparrow

\downarrow expand

Standard form

Standard --> Vertex Form

NOTES - Standard to Vertex Form.pdf

STANDARD

$$y = ax^2 + bx + c$$

- 'a' value
 - stretch factor
 - direction of opening
- y-intercept

VERTEX

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

- 'a' value
 - stretch factor
 - direction of opening
- vertex
 - A.O.S
 - Domain/Range
 - Max/Min y value
 - Sketch/Graph

We need to FACTOR... 'Complete the Square' Method!!!

S \rightarrow V by completing the square

STEPS:

- 1) Factor out the 'a' value from both the x and x^2 terms [GCF].
- 2) **Complete the square** on the x term...
 - take half and square it!
 - add this constant within bracket
 - subtract constant outside bracket multiplied by the 'a' value in front.
- 3) **FACTOR** the perfect square trinomial

Note: $\sqrt{\text{First}}$ & $\sqrt{\text{Last}}$ with sign from middle

VERTEX FORM!!!

EXAMPLE #1...

$$y = x^2 - 6x + 4$$

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

$$y = (x - 3)^2 - 5$$

*a = 1
open up
y int
(0, 4)*

vertex (3, -5)

More Examples: S → V : Complete the square with "a=1"

#2. $y = (x^2 + \underline{14x} + \underline{49}) - 49(1)$

$y = (x + 7)^2 - 49$

a=1
y-int (0,0)

vertex (-7, -49)

y-int (0, -15)

#3. $y = x^2 - 8x - 15$

$y = (x^2 - \underline{8x} + \underline{16}) - 16(1) - 15$

$y = (x - 4)^2 - 31$

vertex (4, -31)

#4. $y = x^2 + 9x + 2$

$y = (x^2 + \underline{9x} + \frac{81}{4}) - \frac{81}{4} + \frac{2 \cdot 4}{4}$

$y = (x + \frac{9}{2})^2 - \frac{73}{4}$

y-int (0,2) $\left\{ \left(\frac{9}{2}\right)^2 = \frac{81}{4} \right.$

vertex $\left(-\frac{9}{2}, -\frac{73}{4}\right)$

Your Turn...

Yint
(b, 7)

$$y = x^2 - \underline{12}x + 7$$

$$y = (x^2 - 12x + 36) - 36 + 7$$

$$y = (x - 6)^2 - 29$$

vertex
(6, -29)

Examples: S → V: Complete the square with "a ≠ 1".

#1. $y = 4x^2 - 24x$

$y = 4(x^2 - 6x)$

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

$y = 4(x - 3)^2 - 36$ Standard

$a = 4$ opens up
 $s.f. = 4$
 (narrow)

vertex
 $(3, -36)$

$a = -3$ opens down
 $s.f. = 3$
 (narrow)

vertex
 $(2, 22)$

#2. $y = -3x^2 + 12x + 10$

$y = -3(x^2 - 4x) + 10$

$y = -3(x^2 - 4x + 4) - 4(-3) + 10$

$y = -3(x - 2)^2 + 22$

Your Turn . . .

$$y = \underline{4}x^2 - 2\underline{4}x + 5$$

$$y = \underline{4}(x^2 - 6x) + 5$$

$$y = 4(x^2 - \underline{6}x + 9) - 9(4) + 5$$

$$y = 4(x - 3)^2 - 36 + 5$$

$$y = 4(x - 3)^2 - 31$$

HOMEWORK

 **Worksheet - Standard to Vertex and Properties.pdf**

SOLUTIONS...

Algebra 1

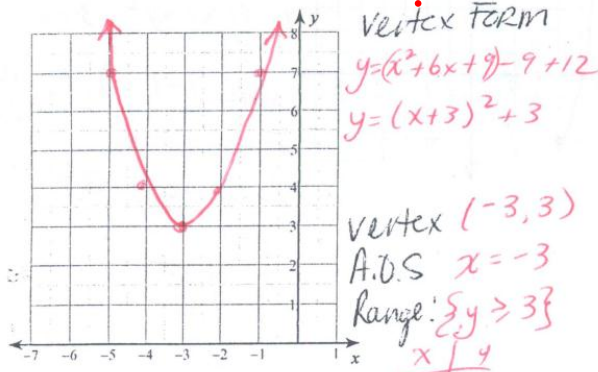
Name Key ID: 1

Assignment

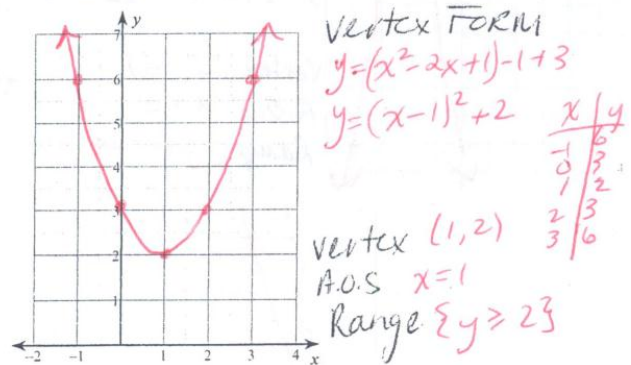
Date _____ Period _____

Sketch the graph of each function.

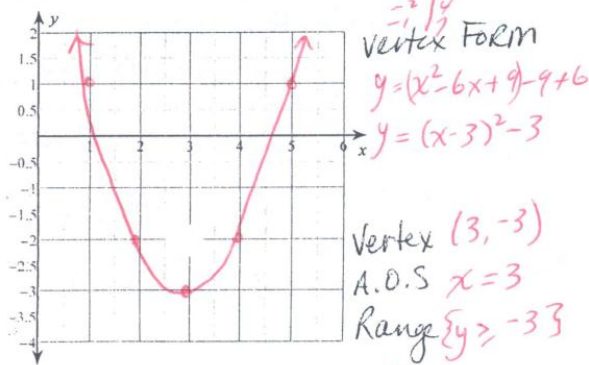
1) $y = x^2 + 6x + 12$



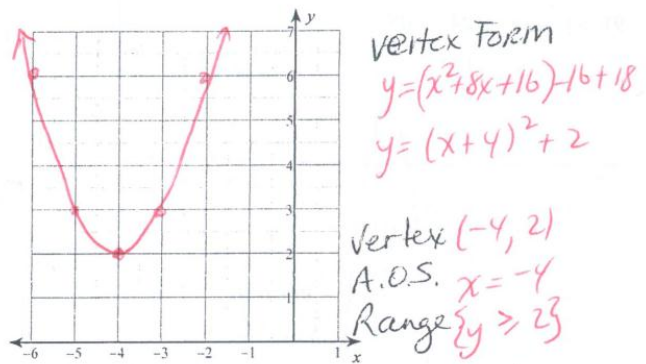
2) $y = x^2 - 2x + 3$



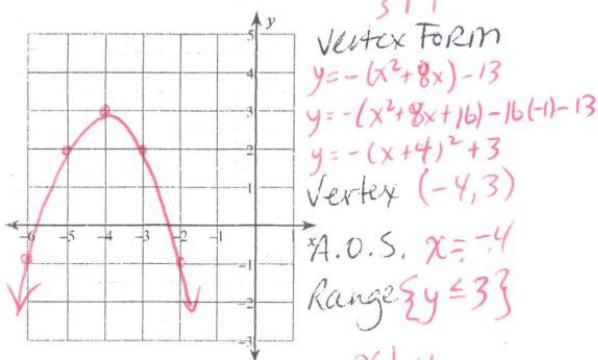
3) $y = x^2 - 6x + 6$



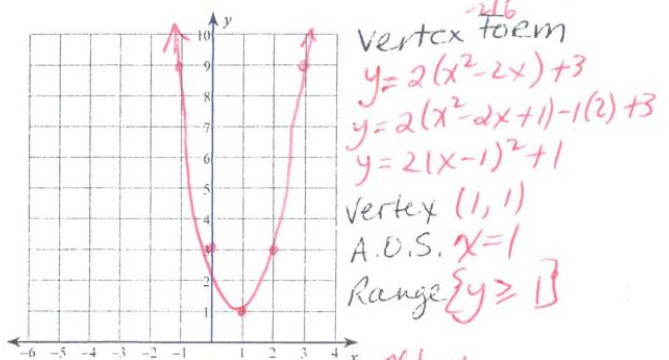
4) $y = x^2 + 8x + 18$



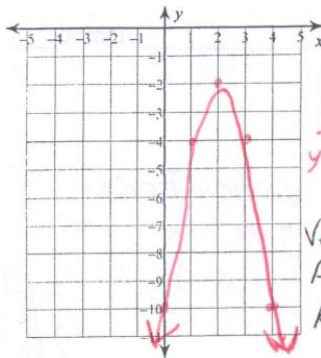
5) $y = -x^2 - 8x - 13$



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



7) $y = -2x^2 + 8x - 10$

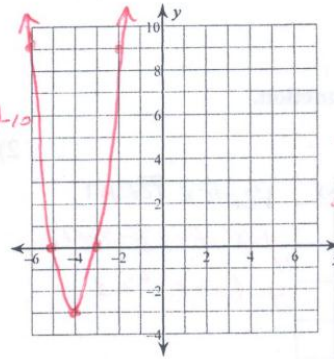


Vertex Form
 $y = -2(x^2 - 4x) - 10$
 $y = -2(x^2 - 4x + 4) - 4(-2) - 10$
 $y = -2(x - 2)^2 - 2$

Vertex $(2, -2)$
 A.O.S. $x = 2$
 Range $\{y \leq -2\}$

x	y
0	-10
1	-4
2	-2
3	-4
4	-10

8) $y = 3x^2 + 24x + 45$

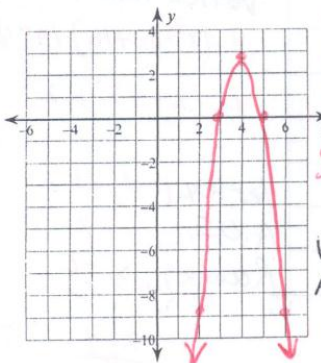


Vertex Form
 $y = 3(x^2 + 8x) + 45$
 $y = 3(x^2 + 8x + 16) - 16(3) + 45$
 $y = 3(x + 4)^2 - 3$

Vertex $(-4, -3)$
 A.O.S. $x = -4$
 Range $\{y \geq -3\}$

x	y
-6	9
-5	0
-4	-3
-3	0
-2	9

9) $y = -3x^2 + 24x - 45$

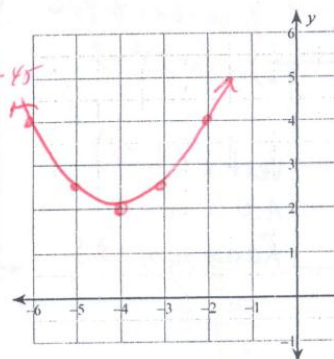


Vertex Form
 $y = -3(x^2 - 8x) - 45$
 $y = -3(x^2 - 8x + 16) - 16(-3) - 45$
 $y = -3(x - 4)^2 + 3$

Vertex $(4, 3)$
 A.O.S. $x = 4$
 Range $\{y \leq 3\}$

x	y
2	-9
3	0
4	3
5	0
6	-9

10) $y = \frac{1}{2}x^2 + 4x + 10$



Vertex Form
 $y = \frac{1}{2}(x^2 + 8x) + 10$
 $y = \frac{1}{2}(x^2 + 8x + 16) - 16(\frac{1}{2}) + 10$
 $y = \frac{1}{2}(x + 4)^2 + 2$

Vertex $(-4, 2)$
 A.O.S. $x = -4$
 Range $\{y \geq 2\}$

x	y
-6	4
-5	2.5
-4	2
-3	2.5
-2	4

Attachments

NOTES - Standard to Vertex Form.pdf

Worksheet - Standard to Vertex and Properties.pdf