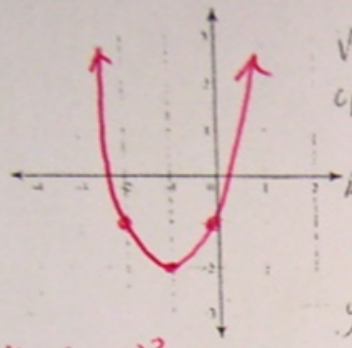
HOMEWORK Solutions...

Sketch the graph of each function.

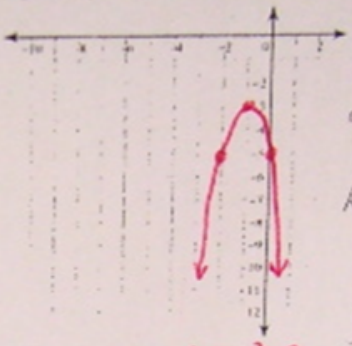
1) $y=(x+1)^2-2$



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

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

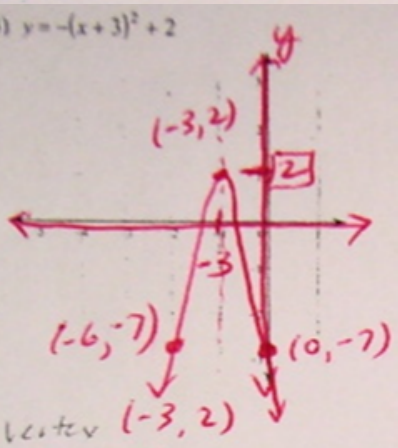
2) $y=-2(x+1)^2-3$



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

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

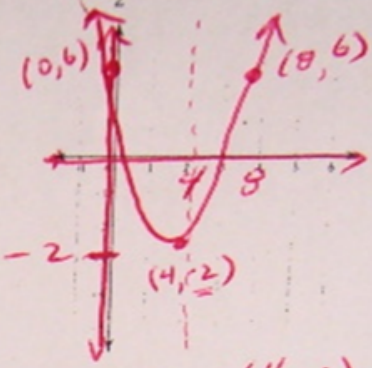
3) $y=-(x+3)^2+2$



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) (sf = ½ wider)

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

✓ Vertex $(4, -2)$

y-int

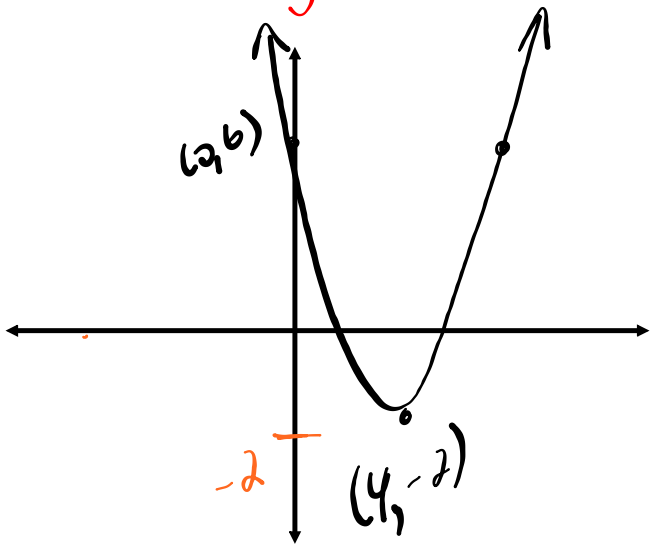
$y = \frac{1}{2}(0-4)^2 - 2$

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

$y = 8 - 2$

$y = 6$ ✓ $(0, 6)$

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



HOMEWORK Solutions...

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

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

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

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

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

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

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

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

$y = 9x^2 - 9x + \frac{9}{4} + \frac{10}{1} \cdot \frac{4}{4}$

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

vertex form

factor ↑ ↓ 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 --> 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: √First & √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. $y = x^2 + 14x$ $+ 49 - 49(1)$

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

$a = 1$
y-int $(0, 0)$
vertex $(-7, -49)$

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

$y = (x^2 - 8x + 16 - 16(1)) - 15$

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

y-int $(0, -15)$
vertex $(4, -31)$

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

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

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

y-int $(0, 2)$
$(\frac{9}{2})^2 = \frac{81}{4}$
vertex $(-\frac{9}{2}, -\frac{73}{4})$

Your Turn...

y-int (0, 7)

$y = x^2 - 12x + 7$

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

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

vertex $(6, -29)$

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

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

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

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

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

$a = 4$ opens up
s.f. = 4 (narrow)
vertex $(3, -36)$

Standard

$a = -3$ opens down
s.f. = 3 (narrow)
y-int $(0, 10)$

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

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

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

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

vertex $(2, 22)$

Your Turn . . .

$y = 4x^2 - 24x + 5$

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

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

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

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

HOMEWORK

Worksheet - Standard to Vertex and Properties.pdf

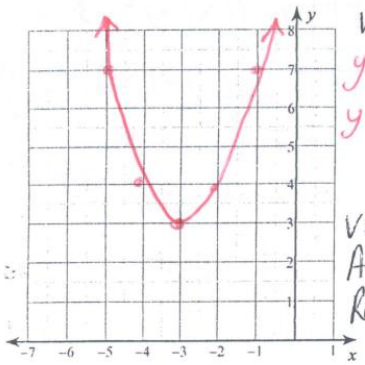
SOLUTIONS...

Algebra 1 Name Key ID: 1

Assignment Date _____ Period ____

Sketch the graph of each function.

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

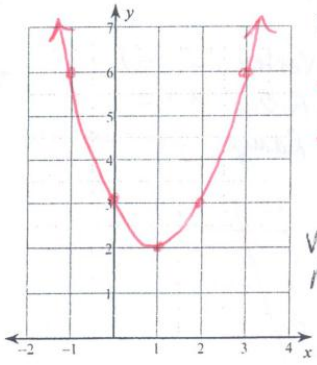


Vertex Form
$y=(x^2+6x+9)-9+12$
$y=(x+3)^2+3$

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

x	y
-5	3
-3	3
-2	4
-1	7

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

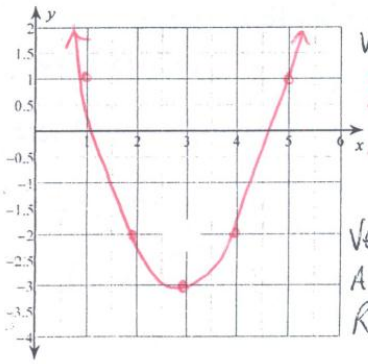


Vertex Form
$y=(x^2-2x+1)-1+3$
$y=(x-1)^2+2$

Vertex $(1, 2)$
A.O.S $x=1$
Range $\{y \geq 2\}$

x	y
-1	6
0	3
1	2
2	3
3	6

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

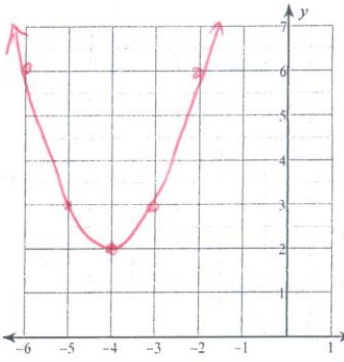


Vertex Form
$y=(x^2-6x+9)-9+6$
$y=(x-3)^2-3$

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

x	y
2	1
3	-2
4	-3
5	-2
6	1

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

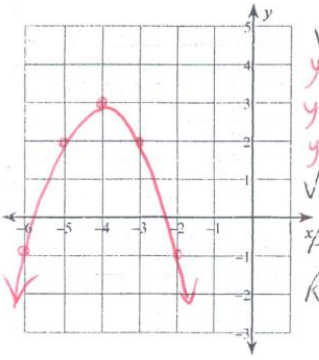


Vertex Form
$y=(x^2+8x+16)-16+18$
$y=(x+4)^2+2$

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

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

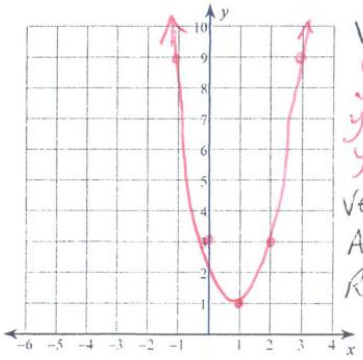
5) $y = -x^2 - 8x - 13$



Vertex Form
$y=-(x^2+8x)-13$
$y=-(x^2+8x+16)-16(-1)-13$
$y=-(x+4)^2+3$
Vertex $(-4, 3)$
A.O.S. $x=-4$
Range $\{y \leq 3\}$

x	y
-6	4
-5	2
-4	3
-3	2
-2	-1

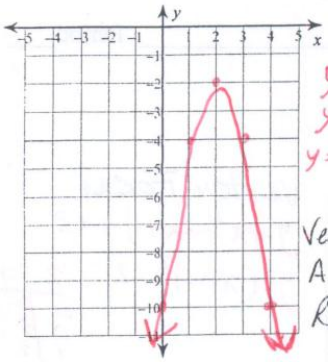
6) $y = 2x^2 - 4x + 3$



Vertex form
$y=2(x^2-2x)+3$
$y=2(x^2-2x+1)-1(2)+3$
$y=2(x-1)^2+1$
Vertex $(1, 1)$
A.O.S. $x=1$
Range $\{y \geq 1\}$

x	y
-1	9
0	3
1	1
2	3
3	9

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

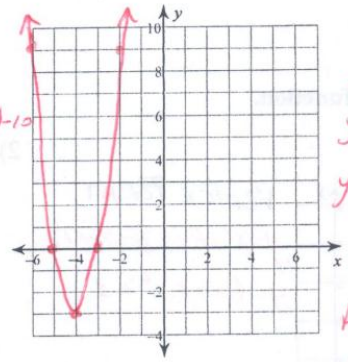


Vertex Form
$y = -2(x^2 - 4x) - 10$
$y = -2(x^2 - 4x + 4) - 4(-2) - 10$
$y = -2(x-2)^2 - 2$

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

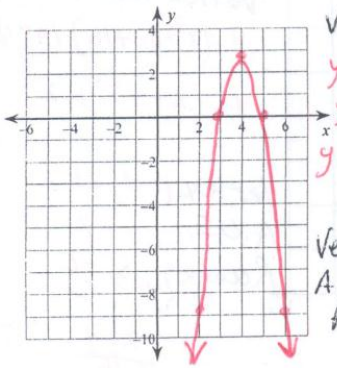


Vertex Form
$y = 3(x^2 + 8x) + 45$
$y = 3(x^2 + 8x + 16) - 16(3) + 45$
$y = 3(x+4)^2 - 3$

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

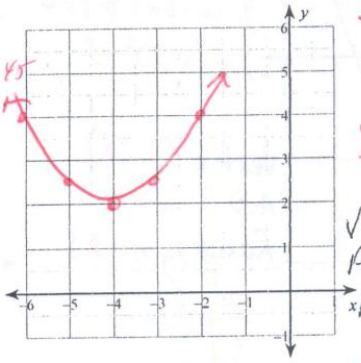


Vertex Form
$y = -3(x^2 - 8x) - 45$
$y = -3(x^2 - 8x + 16) - 16(-3) - 45$
$y = -3(x-4)^2 + 3$

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

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