

**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!!!**

# HOMEWORK QUESTIONS???

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Worksheet - Standard to Vertex (a = 1).pdf

Do even #'s

(16)

$$y = x^2 - 5x - 2$$

$a = 1$   
open up  
same

$$y = \left( x^2 - 5x + \frac{25}{4} \right) - \frac{25}{4} - \frac{2 \cdot 4}{4}$$

$$y = \left( x - \frac{5}{2} \right)^2 - \frac{33}{4}$$

Vertex  $\left( \frac{5}{2}, -\frac{33}{4} \right)$

$y$  int  $(0, -2)$

$$\left( \frac{5}{2} \right)^2 = \frac{25}{4}$$

$$\textcircled{6} \quad y = 2x^2 + 4x$$

y.int  
(0,0)

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

Vertex  
(-1, -2)

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

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#1.  $y = 4x^2 - 24x$  y int (0,0)

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

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

$$y = 4(x + 3)^2 - 36 \quad \text{vertex}(-3, -36)$$

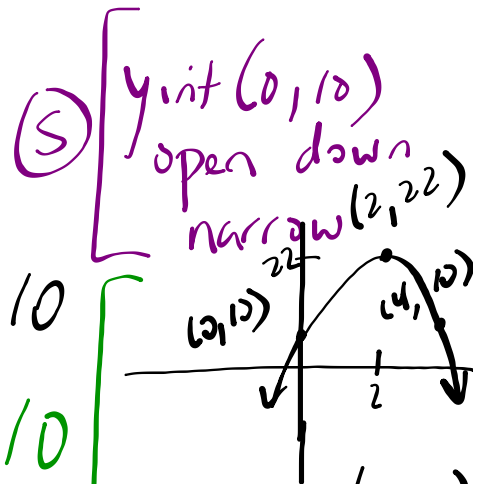
(S) #2.  $y = -3x^2 + 12x + 10$

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

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

$y = -3(x - 2)^2 + 12 + 10$

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



vertex  $(2, 22)$   
 $D: \{x \in \mathbb{R}\}$   
 $R: \{y \leq 22\}$   
 max  $y$  value of 22  
 AOS  $x = 2$

#3.  $y = -5x^2 - 15x + 9$

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

$y = -5(x^2 + 3x + \frac{9}{4}) - \frac{9(-5)}{4} + \frac{9 \cdot 4}{4}$

$y = -5(x + \frac{3}{2})^2 + \frac{45}{4} + \frac{36}{4}$

$y = -5(x + \frac{3}{2})^2 + \frac{81}{4}$

$y_{int}(0, 9)$

$(\frac{3}{2})^2 = \frac{9}{4}$

vertex  $(-\frac{3}{2}, \frac{81}{4})$

What about having a fractional 'a' value???

#4.  $y = \frac{3}{4}x^2 + 12x - 5$

$y = \frac{3}{4}(x^2 + 16x) - 5$

$y = \frac{3}{4}(x^2 + 16x + 64) - 64 \left(\frac{3}{4}\right) - 5$


$y = \frac{3}{4}(x + 8)^2 - 48 - 5$

$y = \frac{3}{4}(x + 8)^2 - 53$  vertex  $(-8, -53)$

$$\left. \begin{array}{l} 12 \div 3 \\ \quad \quad \underline{4} \\ 4 \\ 12 - \underline{4} \\ \quad \quad \underline{8} \\ 16 \end{array} \right\}$$



# HOMEWORK...

 Worksheet - Standard to Vertex (any value of a).pdf

## Attachments

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NOTES - Standard to Vertex Form.pdf

Worksheet - Standard to Vertex ( $a = 1$ ).pdf

Worksheet - Standard to Vertex (any value of  $a$ ).pdf