

MCF 3MI

Unit 4 - Standard and Vertex Form

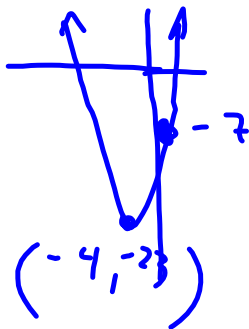
Day 3 - Completing the Square - Day 1

Example 1: Write in vertex form. State the minimum value of the function and when it occurs. $y = x^2 + 8x - 7$ $y = \underline{a}x^2 + \underline{b}x + c$

$$y = x^2 + 8x + 16 - 16 - 7$$

$$= 1(x + 4)^2 - 23$$

Vertex is $(-4, -23)$



Step 1: Factor "a" out of the first two terms

$$\left(\frac{8}{2}\right)^2 = 16$$

Step 2: Divide "b" by 2, square it, then add and subtract that number

Step 3: Pull the special number out of the brackets

Step 4: Factor the perfect square trinomial

Example 2: Find the vertex by completing

the square: $f(x) = 2x^2 + 20x - 13$

$$y = -x^2 +$$

$$y = 2(x^2 + 10x) - 13$$

Step 1: Factor "a" out of the first two terms

$$y = 2(x^2 + 10x + 25 - 25) - 13$$

Step 2: Divide "b" by 2, square it, then add and subtract that number

$$\left(\frac{10}{2}\right)^2 = 25$$

$$y = 2(x + 5)^2 - 50 - 13$$

Step 3: Pull the special number out of the brackets

$$y = 2(x + 5)^2 - 63$$

Step 4: Factor the perfect square trinomial

Vertex is $(-5, -63)$

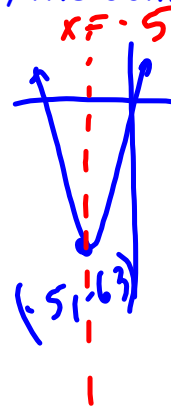
Also state the axis of symmetry, the max or min value, the domain and the range.

AOS $\rightarrow x = -5$

max/min $\rightarrow -63$

D: $\{x \mid x \in \mathbb{R}\}$

R: $\{y \mid y \in \mathbb{R}, y \geq -63\}$



Example 3: Write in vertex form. State the maximum value of the function and when it occurs.

$$f(x) = -\frac{1}{2}x^2 - 3x + 5$$

Practice Questions.

Find the maximum or minimum value of the function and the value of x when it occurs.

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

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

3) $y = 13 + x^2 - 20x$

4) $y = -x^2 - 14x - 5$

5) $y = 10 - 10x - x^2$

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

7) $y = 3x^2 - 12x + 11$

8) $y = -2x^2 - 4x + 1$

9) $y = -36x + 6x^2 - 5$

10) $y = x^2 + 3x + 1$

11) $y = x^2 - x - 2$

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

13) $y = -4x^2 + 4x - 9$

ANSWERS

1) min of -43 at $x = -6$

2) max of 10 at $x = 3$

3) min of -87 at $x = 10$

4) max of 44 at $x = -7$

5) max of 35 at $x = -5$

6) min of -18 at $x = -3$

7) min of -1 at $x = 2$

8) max of 3 at $x = -1$

9) min of -59 at $x = 3$

10) min of $-5/4$ at $x = -3/2$

11) min of $-9/4$ at $x = 1/2$

12) min of $-1/3$ at $x = -1/3$

13) max of -8 at $x = 1/2$