Section 5 – Topic 6
Converting Quadratic Expressions and Functions

We previously converted quadratic equations from standard form to vertex form.

Let's take a deeper look at converting quadratic equations.

Let's Practice!

1. Convert the following quadratic function to standard form.

$$f(x) = (2x + 3)(x - 5) + 8x - 5$$

standard

$$ax^2 + bx + c$$

vertex

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

$$= 2x^2 - 10x + 3x - 15 + 8x - 5$$

$$f(x) = 2x^2 + x - 20$$

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2. Complete the square in the equation to reveal the minimum value of the function it defines.

$$y = 3x^2 - 5x + 4$$

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

$$\left(\frac{5}{3} \div 2\right)^2$$

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

$$\left(\frac{5}{3} \cdot \frac{1}{2}\right)^2$$

$$\left(\frac{5}{6}, \frac{23}{12}\right)$$

$$y = 3\left(x^2 - \frac{5}{3} + \frac{25}{36}\right) + 4 - \frac{75}{36}$$

$$\left(\frac{5}{6}\right)^2 = \frac{25}{36}$$

$$y = 3\left(x - \frac{5}{6}\right)^2 + \frac{144}{36} - \frac{75}{36}$$

$$y = 3\left(x - \frac{5}{6}\right)^2 + \frac{23}{12}$$

$$\frac{69}{36}$$

Try It!

3. The following quadratic function is in vertex form. Write it in standard form.

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

$$\frac{2}{5}\left(x^2 - x + \frac{1}{4}\right) + \frac{1}{3}$$

$$\frac{2}{5}x^2 - \frac{2}{5}x + \frac{2}{20} + \frac{1}{3}$$

$$\frac{6}{60} + \frac{20}{60} = \frac{26}{60} = \frac{13}{30}$$

$$f(x) = \frac{2}{5}x^2 - \frac{2}{5}x + \frac{13}{30}$$

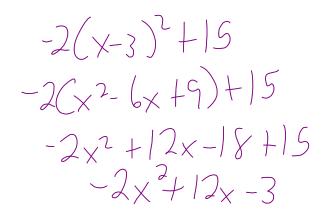4. Convert the following quadratic equation into standard form.

$$\left(y = \frac{(x-3)^2}{4} + \frac{x}{3} - \frac{5}{2} \right) 12$$

$$y = \frac{12(x-3)^2}{4} + \frac{12x}{4} - \frac{60}{2}$$

$$y = 3(x^2 - 6x + 9) + 3x - 30$$

$$3x^2 - 18x + 27 + 3x - 30$$

$$y = 3x^2 - 15x - 3$$

5. Complete the square in the expression to reveal the vertex.

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

$$-(x + 4)(x - 3) + 5x$$

$-(x^2 - 3x + 4x - 12) + 5x$

$-(x^2 + x - 12) + 5x$

$-x^2 - x + 12 + 5x$

$-x^2 + 4x + 12$

$(-x^2 + 4x +) + 12$

$-(x^2 - 4x + 4) + 12 - (-4)$

$-(x - 2)^2 + 16$

$(2, 16)$

$2(x-3)^2-15$

$2(x^2-6x+9)-15$

$2x^2-12x+18-15$

$2x^2-12x+3$ Ⓓ

D
A
B
C

$-2(x-3)^2+15$

$-2(x^2-6x+9)+15$

$-2x^2+12x-18+15$

$-2x^2+12x-3$