

**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.

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

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

$$2x^2 + x - 20$$

$$ax^2 + bx + c$$

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

(vertex)

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

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

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

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

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

$$y = 3 \left( x - \frac{5}{6} \right)^2 + \frac{23}{36}$$

$$\left( \frac{5}{6}, \frac{23}{36} \right)$$

Try It!

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

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

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

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

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

$$\begin{aligned} &(x)^2 \\ &(x)\left(-\frac{1}{2}\right)(2) \\ &\left(-\frac{1}{2}\right)^2 \\ &\frac{2}{20} + \frac{1}{3} \\ &\frac{6}{60} + \frac{20}{60} \\ &\frac{26}{60} = \frac{13}{30} \end{aligned}$$

4. Convert the following quadratic equation into standard form.

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

$$12y = 3(x-3)^2 + 4x - 30$$

$$12y = 3(x^2 - 6x + 9) + 4x - 30$$

$$12y = 3x^2 - 18x + 27 + 4x - 30$$

$$\frac{12y}{12} = \frac{3x^2}{12} - \frac{14x}{12} - \frac{3}{12}$$

$$y = \frac{1}{4}x^2 - \frac{7}{6}x - \frac{1}{4}$$

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

$$\begin{aligned}
 & -(x+4)(x-3) + 5x \\
 & -(x^2 - 3x + 4x - 12) + 5x \\
 & -(x^2 + x - 12) + 5x \\
 & -x^2 - x + 12 + 5x \\
 & -x^2 + 4x + 12 \\
 & (-x^2 + 4x \quad ) + 12 \\
 & -(x^2 - 4x + 4) + 12 - (-4) \\
 & -(x-2)^2 + 16
 \end{aligned}$$

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

**BEAT THE TEST!**

1. Match each quadratic expression below with its equivalent expression in standard form.

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

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

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

B.  $2x^2 + 12x + 3$

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

C.  $-2x^2 - 12x - 3$

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

~~D.~~  $2x^2 - 12x + 3$

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

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

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

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

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

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

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

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

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