

Solving by Factoring

→ If $xy = 0$, then $x = 0$ or $y = 0$.

This property can be expanded to:

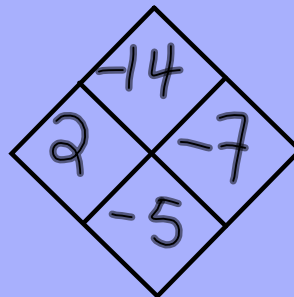
If $(x - a)(x - b) = 0$, then $x - a = 0$ or $x - b = 0$.

$$x^2 - 5x - 14 = 0$$

$$(x+2)(x-7) = 0 \quad \begin{matrix} 1 \cdot 14 \\ 2 \cdot 7 \end{matrix}$$

$$x+2=0 \quad | \quad x-7=0$$

$$\boxed{x = -2 \quad | \quad x = 7}$$



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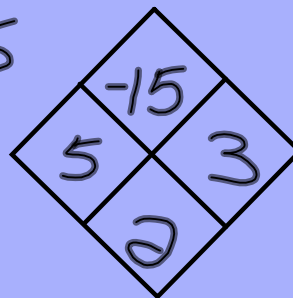
$$3x^2 + 2x - 5 = 0$$

$$x^2 + 2x - 15 = 0 \quad \begin{matrix} 1 \cdot 15 \\ 3 \cdot 5 \end{matrix}$$

$$\left(x + \frac{5}{3}\right)\left(x - \frac{3}{3}\right) = 0$$

$$(3x+5)(x-1) = 0$$

$$\begin{array}{l|l} 3x+5=0 & x-1=0 \\ x = \frac{-5}{3} & x = 1 \end{array}$$



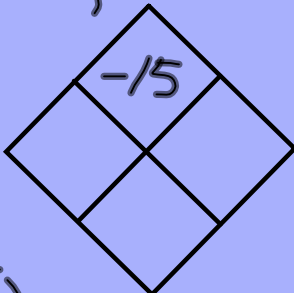
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$$3x^2 + 2x - 5 = 0$$

$$3x^2 + 5x - 3x - 5 = 0$$

$$x(3x+5) - 1(3x+5) = 0$$

$$(3x+5)(x-1) = 0$$

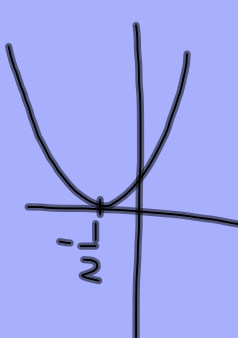
-15
 5, -3


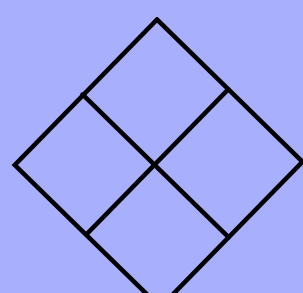
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$$4x^2 + 4x + 1 = 0$$

$$(2x+1)(2x+1) = 0$$

$$x = -\frac{1}{2} \quad x = -\frac{1}{2}$$





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Investigation – perfect square trinomials

Solve these equations by factorization.

1 $x^2 + 10x + 25 = 0$

2 $x^2 + 6x + 9 = 0$

3 $x^2 + 14x + 49 = 0$

4 $x^2 - 8x + 16 = 0$

5 $x^2 - 18x + 81 = 0$

6 $x^2 - 20x + 100 = 0$

What do you notice? Describe any patterns you see in the original quadratic equations.

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$$x^2 + 14x + 49 = 5$$

$$(x + 7)^2 = 5$$

$$x + 7 = \pm\sqrt{5}$$

$$x = -7 \pm\sqrt{5}$$

$$x = -7 \pm\sqrt{5}$$

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$$2x^2 + 8x = 6$$

$$x^2 + 4x = 3$$

$$x^2 + 4x + 4 = 7$$

$$(x+2)(x+2) = 7$$

$$\sqrt{(x+2)^2} = \sqrt{7}$$

$$x+2 = \pm\sqrt{7}$$

$$x = \pm\sqrt{7} - 2$$

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

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

$$3\left(x - \frac{5}{2}\right)\left(x - \frac{5}{2}\right) = \frac{8}{4} + \frac{25}{4}$$

$$\cancel{3}\left(x - \frac{5}{2}\right)^2 = \frac{83}{4}$$

$$\sqrt{\left(x - \frac{5}{2}\right)^2} = \pm\sqrt{\frac{83}{4}}$$

$$x - \frac{5}{2} = \pm\sqrt{\frac{83}{4}}$$

$$x = \frac{5}{2} \pm \sqrt{\frac{83}{4}}$$

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

$$3x(x-5) = 2$$

$$3x = 2 \quad | \quad x-5 = 2$$

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$$y = \underline{x^2 - 8x + 18}$$

$$y = x^2 - 8x + \underline{16} + 18 - \underline{16}$$

$$y = (x-4)(x-4) + 2$$

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

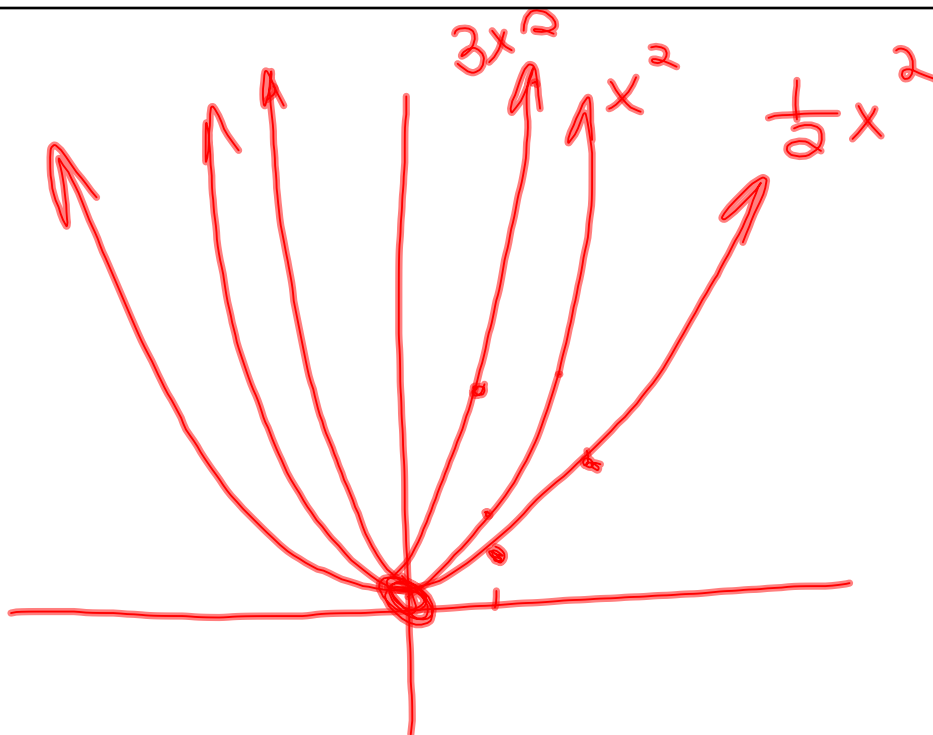
Vertex (4, 2)

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vertex $(5, -10)$

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

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$$y = \underbrace{3x^2 + 12x} - 2$$

$$y = 3\left(x^2 + 4x + \frac{4}{1}\right) - 2 - \underline{12}$$

$$y = 3(x+2)^2 - 14$$

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