

Pre-Calculus 11: Solving Quadratic Quiz #1

Full credit will only be awarded for all work shown in a neat and organized manner.

1. Find a quadratic equation in general form ($ax^2 + bx + c = 0$) that has solutions $x = -3$ and $x = \frac{2}{5}$.

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

$$= \boxed{x^2 + \frac{13}{5}x - \frac{6}{5}}$$

2. Solve each quadratic equation by factoring (No completing the square allowed!)

Don't forget to check your answers

a. $(x+5)(x-2) = 18$

$$x^2 + 5x - 2x - 10 = 18$$

$$x^2 + 3x - 28 = 0$$

$$\begin{array}{r|l} \otimes -28 & (7, -4) \\ \oplus 3 & 3 \end{array}$$

$$(x+7)(x-4) = 0$$

$$\boxed{x = -7, 4}$$

check $x=7$

$$(-7+5)(-7-2) = 18$$

$$(-2)(-9) = 18$$

$$18 = 18 \checkmark$$

check $x=4$

$$(4+5)(4-2) = 18$$

$$(9)(2) = 18$$

$$18 = 18 \checkmark$$

c. $6z^2 + z - 1 = 6z + 3$

$$6z^2 - 5z - 4 = 0$$

$$\begin{array}{r|l} \otimes -24 & (-8, 3) \\ \oplus -5 & -5 \end{array}$$

$$\oplus -5 \quad -5$$

$$6z^2 - 8z + 3z - 4 = 0$$

$$2z(3z-4) + 1(3z-4) = 0$$

$$(2z+1)(3z-4) = 0$$

$$z = -\frac{1}{2}, \frac{4}{3}$$

check $z = -\frac{1}{2}$

$$6\left(-\frac{1}{2}\right)^2 + \left(-\frac{1}{2}\right) - 1 = 6\left(-\frac{1}{2}\right) + 3$$

$$\frac{3}{2} - \frac{1}{2} - 1 = -3 + 3$$

$$0 = 0 \checkmark$$

check $z = \frac{4}{3}$

$$6\left(\frac{4}{3}\right)^2 + \frac{4}{3} - 1 = 6\left(\frac{4}{3}\right) + 3$$

$$\frac{32}{3} + \frac{4}{3} - 1 = 8 + 3$$

$$11 = 11 \checkmark$$

b. $\frac{1}{2}p^2 - 4p = 3p$

$$\frac{1}{2}p^2 - 7p = 0$$

$$\frac{1}{2}p(p-14) = 0$$

$$p = 0, 14$$

check $p=0$

$$\frac{1}{2}(0)^2 - 4(0) = 3(0)$$

$$0 = 0 \checkmark$$

check $p=14$

$$\frac{1}{2}(14)^2 - 4(14) = 3(14)$$

$$98 - 56 = 42$$

$$42 = 42 \checkmark$$

d. $\frac{3}{x-5} + 2 = \frac{15}{x^2-5x}$

$$x(x-5)\left(\frac{3}{x-5} + 2\right) = \frac{15}{x(x-5)} \cdot x(x-5) \quad (x \neq 0, 5)$$

$$3x + 2x(x-5) = 15$$

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

$$2x^2 - 7x - 15 = 0$$

$$\begin{array}{r|l} \otimes -30 & (10, 5) \\ \oplus -7 & -7 \end{array} \quad 2x^2 - 10x + 3x - 15 = 0$$

$$\oplus -7 \quad -7 \quad 2x(x-5) + 3(x-5) = 0$$

$$(2x+3)(x-5) = 0$$

$$x = \cancel{5}, \boxed{-\frac{3}{2}}$$

Undefined

3. Solve each quadratic equation by completing the square. (No factoring allowed!) Answer exactly

a. $3x^2 - 4x = 2x^2 + 9$

$$x^2 - 4x - 9 = 0$$

$$\left[(x^2 - 4x + k) - k \right] - 9 = 0 \Rightarrow \left[(x^2 - 4x + 4) - 4 \right] - 9 = 0$$

$$\left(\frac{1}{2}(-4) \right)^2 = (-2)^2 = 4$$

$$(x-2)^2 - 13 = 0$$

$$(x-2)^2 = 13$$

$$x-2 = \pm\sqrt{13} \Rightarrow x = 2 \pm \sqrt{13}$$

b. $9t^2 + 12t + 4 = 0$

$$9 \left[\left(t^2 + \frac{4}{3}t + k \right) - k \right] + 4 = 0$$

$$\left(\frac{1}{2} \left(\frac{4}{3} \right) \right)^2 = \left(\frac{2}{3} \right)^2 = \frac{4}{9}$$

$$9 \left[\left(t^2 + \frac{4}{3}t + \frac{4}{9} \right) - \frac{4}{9} \right] + 4 = 0$$

$$9 \left(t + \frac{2}{3} \right)^2 - 4 + 4 = 0$$

$$9 \left(t + \frac{2}{3} \right)^2 = 0 \Rightarrow \left(t + \frac{2}{3} \right)^2 = 0 \Rightarrow t + \frac{2}{3} = 0$$

$$t = -\frac{2}{3}$$

c. $\frac{1}{2}m(10-m) = 20$

$$-\frac{1}{2}m^2 + 5m = 20$$

$$-\frac{1}{2}m^2 + 5m - 20 = 0$$

$$-\frac{1}{2} \left[(m^2 - 10m + k) - k \right] - 20 = 0$$

$$\left(\frac{1}{2}(-10) \right)^2 = (-5)^2 = 25$$

$$-\frac{1}{2} \left[(m^2 - 10m + 25) - 25 \right] - 20 = 0$$

$$-\frac{1}{2}(m-5)^2 + \frac{25}{2} - \frac{40}{2} = 0$$

$$-\frac{1}{2}(m-5)^2 - \frac{15}{2} = 0 \Rightarrow -\frac{1}{2}(m-5)^2 = \frac{15}{2}$$

$$(m-5)^2 = -15$$

$$m-5 = \sqrt{-15} \leftarrow \text{undefined}$$

No Solutions