Factoring!

$a \searrow$ 3 $-4/3$

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a} \quad 3(x-3)(x+4/3)$$

d) $3x^2 - 5x - 12$

$a = 3$
$b = -5$
$c = -12$

$$\frac{-(-5) \pm \sqrt{(-5)^2-4(3)(-12)}}{2(3)} \quad \boxed{(x-3)(3x+4)}$$

$$\frac{5 \pm \sqrt{25+144}}{6} =$$

$$\frac{5 \pm \sqrt{169}}{6} \quad \frac{5 \pm 13}{6} \qquad \frac{5+13}{6} \quad \frac{5-13}{6}$$

$$\frac{18}{6} \quad \frac{-8}{6}$$

$$3 \quad -4/3$$

5.) (10 pts total, 2.5 pts each) Evaluate the discriminant of the equation. Indicate the number of real roots for each.

$a = 1$
$b = -4$
$c = +4$

a) $x^2 - 4x + 4$

$$\boxed{\frac{-b \pm \sqrt{b^2-4ac}}{2a}} \quad h$$

$b^2 - 4ac$
$(-4)^2 - 4(1)(4)$
$16 - 16 = 0$

$$\boxed{1 \text{ real root}}$$

b) $-2x^2 + 6x - 14$

$a = -2$
$b = 6$
$c = -14$

$b^2 - 4ac$
$(6)^2 - 4(-2)(-14)$
$36 - 112 = -76$

$$\boxed{0 \text{ real roots}}$$

c) $x^2 + 9x + 18$

d) $2x^2 + 11x - 21$

3

6.) (15 pts total, 7.5 pts each) Solve using the Quadratic Equation.

a) $x^2 = 3x + 2$

$$-3x - 2 \quad -3x \quad -2 \qquad \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$a = 1$

$b = -3$

$c = -2$

$$\frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)}$$

$$\frac{3 \pm \sqrt{9 + 8}}{2}$$

$$\boxed{\frac{3 \pm \sqrt{17}}{2}}$$

b) $3x^2 - 5x = -12$

7.) (15 pts total, 7.5 pts each) Place each equation in vertex form by completing the square. Please show all your work.

a) $x^2 = 5x + 14$

Complete the square → vertex form

b) $2x^2 + 6x - 7 = 0$

$\left(\dfrac{2x^2}{2} + \dfrac{6x}{2}\right) - 7 = 0$

$2\left(x^2 + 3x\right) - 7 = 0$

$\left(\dfrac{3}{2}\right)^2 \qquad +\dfrac{9}{4} \qquad -\dfrac{9}{4}(2)$

$2\left(x^2 + 3x + \dfrac{9}{4}\right) - 7 - \dfrac{9}{2}$

1.) 2020 it

2.) factor out "a"

3.) $\left(\dfrac{b}{2}\right)^2$ add in / sub out

4.) square root 1st and last

$2\left(x^2 + 3x + \dfrac{9}{4}\right) - \dfrac{23}{2}$

$\sqrt{x^2} \downarrow \quad \downarrow \quad \sqrt{\dfrac{9}{4}}$ $\sqrt{9/4}$

$\boxed{2\left(x + \dfrac{3}{2}\right)^2 - \dfrac{23}{2}}$

8.) (20 pts total, 10 pts each) Graph each equation **completely**. Plot all roots, intercepts, and the vertex.

a) $x^2 + 6x + 9$
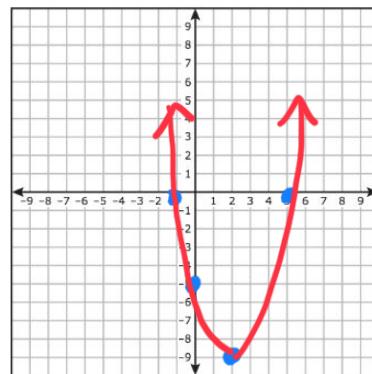
Scenario #2

vertex → zeros

$\left(x^2 - 4x\right) - 5$

$\left(-\dfrac{4}{2}\right)^2 \ +4 \ -4$

$\left(x^2 - 4x + 4\right) - 9$

$\left(x - 2\right)^2 - 9$

vertex $(2, -9)$

$X - 2 = \pm 3$
$+2 \qquad +2$

$X = 2 + 3$
$\qquad 5$

$\left(X - 2\right)^2 - 9 = 0$
$\qquad +9 \ +9$

$\sqrt{\left(X - 2\right)^2} = \sqrt{9}$

$2 - 3$
-1

y-int

b) $x^2 - 4x - 5$

Graph vertex, X-int, y-int
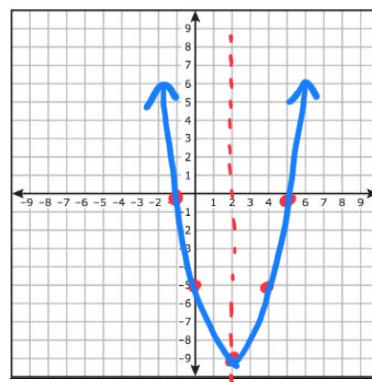
Scenario #1

Zeros → Vertex

$\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\dfrac{4 \pm \sqrt{36}}{2}$

$\dfrac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-5)}}{2(1)}$

$4 \pm \sqrt{16 + 20}$ ⁄ 2

$\dfrac{4 \pm 6}{2}$

$\dfrac{4 + 6}{2} = 5$

$\dfrac{4 - 6}{2} = -1$

Average of zeros

$\dfrac{5 + (-1)}{2} = \dfrac{4}{2} = 2$

$(2)^2 - 4(2) - 5 = 4 - 8 - 5 = -9$

5