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

Factor

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

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

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

$\frac{5 \pm \sqrt{25 + 144}}{6} = \frac{5 \pm \sqrt{169}}{6}$

$\frac{5+13}{6}$ $\frac{5-13}{6}$

$\frac{18}{6} = 3$ $\frac{-8}{6} = -4/3$

$3(x - 4/3) = (3x + 4)$

$\frac{5 \pm 13}{6}$

$3$ $-4/3$

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

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

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

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

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

$b^2 - 4ac$

$(-4)^2 - 4(1)(4)$

$16 - 16 = 0$

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

1 real root

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

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

$b^2 - 4ac$

$(6)^2 - 4(-2)(-14)$

$36 - 112 = -76$

0 real roots

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

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

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

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

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

$+12 \quad +12$

$3x^2 - 5x + 12 = 0$

$a = 3$

$b = -5$

$c = 12$

Find zeros

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

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

$$\frac{5 \pm \sqrt{25-144}}{6}$$

$$\frac{5 \pm \sqrt{-119}}{6}$$

$$\boxed{\frac{5 \pm i\sqrt{119}}{6}}$$

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!

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

1.) 2020 it
2.) factor out a
3.) $(\frac{b}{2})^2$ add in sub out
4.) Square root 1st and last

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

$2(x^2+3x) - 7$ $\quad -\frac{9}{2}$

$(\frac{3}{2})^2 \quad +\frac{9}{4} \quad -\frac{9}{4}(2)$

$\frac{9}{4}$ $\quad 2(x^2+3x+\frac{9}{4}) - 7 - \frac{9}{2}$

$\sqrt{x^2}$ $\quad \sqrt{\frac{9}{4}}$

$2(x+\frac{3}{2})^2 - \frac{23}{2}$

$-\frac{9}{4}(\frac{2}{1}) = \frac{-18\div 2}{4\div 2} = -\frac{9}{2}$

$-7 = -\frac{14}{2} \quad -14/2 - 9/2$

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

$(x+\frac{3}{2})(x+\frac{3}{2}) = x^2+3x+9/4$

a) ~~$x^2 + 6x + 9$~~

Scenario #2

vertex → zeros

$x^2-4x-5$ x int = zeros

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

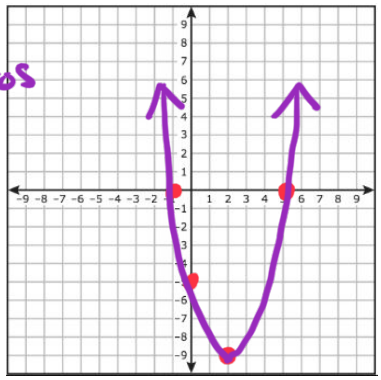
$(\frac{4}{2})^2 \quad +4 \quad -4$

$(x^2-4x+4) - 9$

$(x-2)^2 - 9$ vertex

y-int 2, -9

YOU MUST
- x-int(s)
- y-int
- vertex



$(x-2)^2 - 9 = 0$

$+9 \quad +9$

$\sqrt{(x-2)^2} = \sqrt{9}$

$x-2 = \pm 3$

$+2 \quad +2$

$2+3 = 5$

$2-3 = -1$

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

Scenario #1

zeros → vertex

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

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

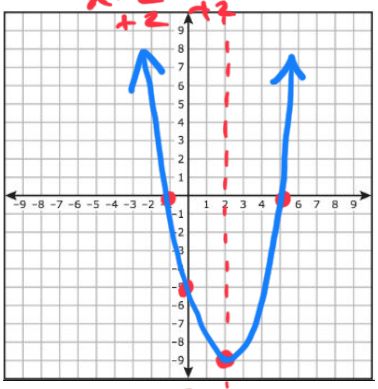
$\frac{4 \pm \sqrt{16+20}}{2}$

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

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

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

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



h = average of zeros

$\frac{-1+5}{2} = \frac{4}{2} = 2$

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