Date: 9.1.2 + 9.1.3: The Quadratic Formula

Quadratic Formula: Given a quadratic equation in Standard Form: $ax^2 + bx + c = 0$

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

$$x = \frac{-b + \sqrt{b^2-4ac}}{2a} \qquad x = \frac{-b - \sqrt{b^2-4ac}}{2a}$$

the discriminant: $b^2 - 4ac$

$b^2 - 4ac = 0$, there is one solution (one root/x-intercept), this is also the vertex.

$b^2 - 4ac =$ "$-$", there is no solution (no roots, x-intercepts (can't take the square root of a negative #))

$b^2 - 4ac =$ "$+$", there are two roots

Vertex = $x = \frac{-b}{2a}$, $y = 0$

9-13) $1x^2 - 3x - 7 = 0$

a) $a = 1$, $b = -3$, $c = -7$

b)

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

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-7)}}{2(1)}$$

$$x = \frac{3 \pm \sqrt{9+28}}{2} = \frac{3 \pm \sqrt{37}}{2} = \frac{3+\sqrt{37}}{2}, \frac{3-\sqrt{37}}{2}$$

≈ 4.5 or -1.5

Date: 9.1.2 + 9.1.3: The Quadratic Formula

9-15) a - d

a) $3x^2+7x+2=0$

$a=3$, $b=7$, $c=2$

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

$$x=\frac{-(7)\pm\sqrt{7^2-4(3)(2)}}{2(3)}$$

$$x=\frac{-7\pm\sqrt{49-24}}{6}$$

$$x=\frac{-7\pm\sqrt{25}}{6}$$

$$\frac{-7+5}{6}=\frac{-2}{6}=\boxed{\frac{-1}{3}} \quad \frac{-7-5}{6}=\frac{-12}{6}=\boxed{-2}$$

b) $2x^2-9x-35=0$

$a=2$, $b=-9$, $c=-35$

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

$$x=\frac{-(-9)\pm\sqrt{(-9)^2-4(2)(-35)}}{2(2)}$$

$$x=\frac{9\pm\sqrt{81+280}}{4}=\frac{9\pm\sqrt{361}}{4}$$

$$\frac{9+19}{4} \text{ or } \frac{9-19}{4}$$

$$\frac{28}{4}=\boxed{7} \text{ or } \frac{-10}{4}=\boxed{-2.5}$$

c+d) on next page...

9-24) $6x^2+11x-10=0$

a) Zero product property

$3x$ -2

5 | $+15x$ | -10

$2x$ | $6x^2$ | $-4x$ | x

$3x$ -2

$-60x^2$, $+15x$, $-4x$, $11x$

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

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

$\frac{3x}{3}=\frac{2}{3}$

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

$2x+5=0$

-5 -5

$\frac{2x}{2}=\frac{-5}{2}$

b) Quadratic formula:

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

$a=6$, $b=11$, $c=-10$

$$x=\frac{-11\pm\sqrt{11^2-4(6)(-10)}}{2(6)}$$

$$x=\frac{-11\pm\sqrt{121+240}}{12}$$

$$=\frac{-11\pm\sqrt{361}}{12}$$

$$=\frac{-11+19}{12} \text{ or } \frac{-11-19}{12}$$

$$=\frac{8}{12}=\boxed{\frac{2}{3}} \text{ or } \frac{-30}{12}=\boxed{-2.5}$$

9-15)

c) $8x^2+10x+3=0$

$a=8$
$b=10$
$c=3$

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

$$x=\frac{-(10)\pm\sqrt{(10)^2-4(8)(3)}}{2(8)}$$

$$x=\frac{-10\pm\sqrt{100-96}}{16}$$

$$x=\frac{-10\pm\sqrt{4}}{16}$$

$$\frac{-10+2}{16} \qquad \frac{-10-2}{16}$$

$$\frac{-8}{16}=\boxed{\frac{-1}{2}} \quad \text{or} \quad \frac{-12}{16}=\boxed{\frac{-3}{4}}$$

d) $x^2-5x+9=0$

$a=1$
$b=-5$
$c=9$

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

$$x=\frac{-(-5)\pm\sqrt{(-5)^2-4(1)(9)}}{2(1)}$$

$$=\frac{5\pm\sqrt{25-36}}{2}$$

$$=\frac{5\pm\sqrt{-11}}{2}$$

no solution!

What the discriminant tells us: