Dr. Katiraie Math 115A Practice Quiz 4 (Section 3-4) Solutions

1) Solve $3x^2 - 7x - 8 = 0$

a = 3 b = −7 c = −8

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(3)(-8)}}{2*3} = \frac{7 \pm \sqrt{145}}{6}$$

Exact Solutions $x = \frac{7+\sqrt{145}}{6}$ $x = \frac{7-\sqrt{145}}{6}$

Approximate solutions $x = 3.17$ $x = -0.84$

2) Solve by factoring or using Quadratic Formula:

a) $x^2+11x-12 = 0$

$(x+12)(x-1) = 0$

$x+12=0$ $x-1=0$

$x=-12$ $x=1$

$12 \cdot (-1) = -12$

$12 + (-1) = 11$

b) $x^2-7x-30 = 0$

$(x-10)(x+3) = 0$

$x-10 = 0$ OR $x+3=0$

$x=10$ $x=-3$

$-10 \cdot 3 = -30$

$-10 + 3 = -7$

3) Solve by using the quadratic formula

a) $28 = 16t^2 + 2t$ $16t^2+2t-28=0$; $a=16$ $b=2$ $c=-28$

$$t = \frac{-2 \pm \sqrt{2^2 - 4(16)(-28)}}{2*16}$$

→ 1.26

→ −1.39

b) $4x^2 + x - 1 = 0$

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

$$x = \frac{-1 \pm \sqrt{1-4(4)(-1)}}{2(4)} = \frac{-1 \pm \sqrt{17}}{8}$$

$\frac{-1+\sqrt{17}}{8} = 0.39$

$\frac{-1-\sqrt{17}}{8} = -0.64$

4) Quadratic Formula in real life: Throwing a Rock

A rock is thrown from the top of a tower that is 300 feet tall. If its height above the ground can be modeled by

$h = -16t^2 + 64t + 300$ where h is in feet, and t is in seconds.

a) To the nearest tenth of a second, how long does it take the rock to reach the ground?

$-16t^2+64t+300=0$ $\quad a=-16 \quad b=64 \quad c=300$

$$t=\frac{-64\pm\sqrt{64^2-4(-16)(300)}}{(2*-16)}=\frac{-64\pm\sqrt{23296}}{-32}$$

(+) → ~~-2.8~~

(−) → 6.8 seconds

b) To the nearest tenth of a foot, how high will the rock go before it starts falling down?

$a=-16 \quad b=64 \quad c=300$

$$t=\frac{-b}{2a}=\frac{-64}{2(-16)}=2 \text{ seconds}$$

$h(2)=-16(2)^2+64(2)+300$

$=364$ feet

c) To the nearest tenth of a second, how long will it take the rock to reach its maximum height?

$$t=\frac{-b}{2a}=\frac{-64}{2(-16)}=2 \text{ seconds}$$

5) Example using the Quadratic Formula for stable population levels.
For a certain population the growth rate G, in thousands of individuals per year depends on the size N, in thousands, of the population. The relation is

$$G = 2 + 2N - .3N^2 = -0.3N^2 + 2N + 2$$

-the population level is stable so the growth rate is 0. At what level is the population stable?

a = -0.3 b = 2 c = 2

$$N = \frac{-2 \pm \sqrt{2^2 - 4(-0.3)(2)}}{2(-0.3)} = \frac{-2 \pm \sqrt{6.4}}{-0.6} = \begin{cases} \xrightarrow{+} -0.883 \\ \xrightarrow{-} 7.5497 \end{cases}$$

Solution N = -0.883 N = 7.550 thousand

But the solution is 7550 because population can not be Negative

6) Find the vertex of $y = 3x^2 - 24x + 10$

$$x = \frac{-b}{2a} = \frac{-(-24)}{2(3)} = \frac{24}{6} = 4$$

$$y = 3(4)^2 - 24(4) + 10 = -38$$

Vertex = $(4, -38)$

7) Find the vertex of $y = 2x^2 - 28x + 12$

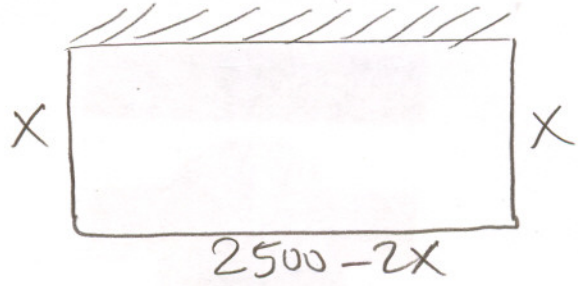
$$x = \frac{-b}{2a} = -\frac{(-28)}{2(2)} = \frac{28}{4} = 7$$

$$y = 2(7)^2 - 28(7) + 12 = -86$$

Vertex = $(7, -86)$

8) Example using vertex—A rectangular pen can be constructed using the side of a barn as one boundary and 2500 ft. of fence to make the other three sides. Find the length and width of the rectangle to make the largest area.

Draw a picture-



Work to solve problem.

$A = X(2500 - 2X)$

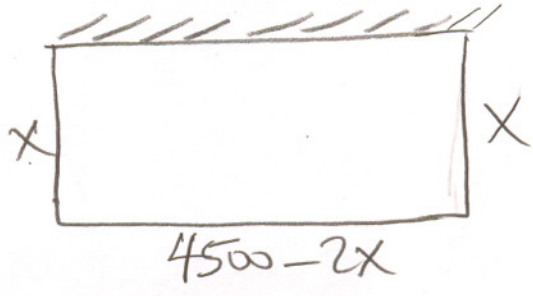
$\text{Area} = 2500X - 2X^2 = -2X^2 + 2500X$

$X = \frac{-b}{2a} = \frac{-2500}{2(-2)} = 625 \text{ feet}$

x = width = 625 ft length = $2500 - 2 * 625 = 1250$ feet

9) Example using vertex—A rectangular pen can be constructed using the side of a barn as one boundary and 4500 ft. of fence to make the other three sides. Find the length and width of the rectangle to make the largest area.

Draw a picture-



Work to solve problem.

$A(X) = X(4500 - 2X)$

$= 4500X - 2X^2 = -2x^2 + 4500x$

$X = \frac{-b}{2a} = \frac{-4500}{2(-2)}$

$= 1125 \text{ feet}$

x = width = 1125 feet length = $4500 - 2 * 1125 = 2250$ feet