Analytic Geometry **Unit 5B Practice WS #2** **Feb 20 2015 (Fri)**

1. The product of two numbers is 1120. Their difference is 3. Find the two numbers.

Projectile Motion Formula	h(t) = final height (height at the end of the problem)
$h(t) = -16t^2 + v_i t + h_i$	v_i = initial velocity
	h_i = initial height (height at the beginning of the problem)
	t = time (from initial height to final height)

2. An amateur rocketry club is holding a competition. There is cloud cover at 1004 ft. If a rocket is launched with a velocity of 315 ft/s, use the function $h(t) = -16t^2 + v_i t + h_i$ to determine how long before the rocket is out of sight.

3. A diver is standing on a platform 24 ft. above the pool. He jumps form the platform with an initial upward velocity of 8 ft/s. Use the formula $h(t) = -16t^2 + v_i t + h_i$, where h is his height above the water, t is the time, v_i is his starting upward velocity, and h_i is his starting height. How long will it take for him to hit the water?

4. If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height h after t seconds is given by the equation $h(t) = -16t^2 + v_i t + h_i$

a. How long will it take for the rocket to return to the ground?

b. After how many seconds will the rocket be 112 feet above the ground?

c. How long will it take the rocket to hit its maximum height?

d. What is the maximum height?

5. The length of a rectangle is 31 centimeters less than five times its width. The area is 72 square centimeters. Find the dimensions of the rectangle.

Analytic Geometry **Unit 5B Practice WS #2** Solution Key **Feb 20 2015 (Fri)**

1. The product of two numbers is 1120. Their difference is 3. Find the two numbers.

first #: x

2nd #: $x-3$

$(x)(x-3)=1120$

$x^2-3x=1120$

$x^2-3x-1120=0$

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

$=\frac{3\pm\sqrt{(3)^2-4(1)(-1120)}}{2(1)}$

$=\frac{3\pm\sqrt{4489}}{2}$

$=\frac{3\pm67}{2}$ $\begin{cases}\frac{3+67}{2} & x=35\\ \frac{3-67}{2} & x=-32\end{cases}$

1st set: 35 and 32

2nd set: -32 and -35

2. An amateur rocketry club is holding a competition. There is cloud cover at 1004 ft. If a rocket is launched with a velocity of 315 ft/s, use the function $h(t)=-16t^2+v_it+h_i$ to determine how long before the rocket is out of sight.

$h(t)=1004$

$v_i=315$

$h_i=0$

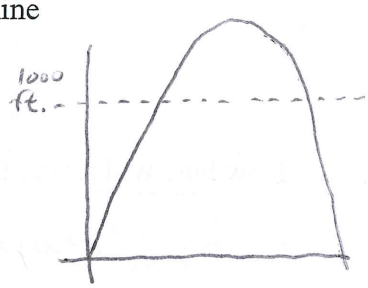
$1004=-16t^2+315t+0$

$16t^2-315t+1004=0$

$\frac{315\pm\sqrt{315^2-4(16)(1004)}}{2(16)}$

$\frac{315\pm\sqrt{34969}}{32}$

$\frac{315\pm187}{32}$ $\begin{cases}\frac{315+187}{32}=15.6875 \text{ seconds} & \text{(reject)}\\ \frac{315-187}{32}=4 \text{ seconds}\end{cases}$



3. A diver is standing on a platform 24 ft. above the pool. He jumps form the platform with an initi8al upward velocity of 8 ft/s. Use the formula $h(t)=-16t^2+v_it+h_i$, where h is his height above the water, t is the time, v_i is his starting upward velocity, and h_i is his starting height. How long will it take for him to hit the water?

$0=-16t^2+8t+24$

$=-8(2t^2-t-3)$

$=-8(2t-3)(t+1)$

$t=3/2$, $t=-1$

$t=1.5$ seconds

4. If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height h after t seconds is given by the equation $h(t) = -16t^2 + v_i t + h_i$

a. How long will it take for the rocket to return to the ground?

$h(t) = 0$ $\quad 0 = -16t^2 + 128t$

$v_i = 128$ $\quad 0 = -16t(t - 8)$

$h_i = 0$ $\quad t = 0, \boxed{t = 8 \text{ seconds}}$

b. After how many seconds will the rocket be 112 feet above the ground?

$h(t) = 112$ $\quad 112 = -16t^2 + 128t$

$v_i = 128$ $\quad 16t^2 - 128 + 112 = 0$

$h_i = 0$ $\quad 16(t^2 - 8t + 7) = 0$

$16(t - 7)(t - 1) = 0$

$\boxed{t = 1 \text{ second} \quad t = 7 \text{ seconds}}$

c. How long will it take the rocket to hit its maximum height?

$t = 4$ secs (between $t = 1$ and $t = 7$)

or

$\text{vertex} = \frac{-b}{2a} = \frac{128}{2(16)} = \frac{128}{32} = \boxed{4 \text{ seconds}}$

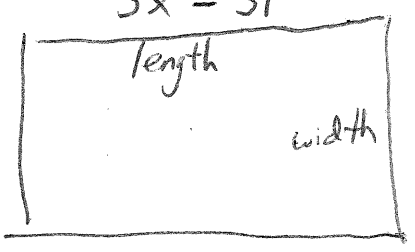
d. What is the maximum height?

$h(t) = -16t^2 + 128t + 0$

$h(4) = -16(4)^2 + 128(4) + 0$

$\boxed{h(4) = 256 \text{ ft}}$

5. The length of a rectangle is 31 centimeters less than five times its width. The area is 72 square centimeters. Find the dimensions of the rectangle.



$(x)(5x - 31) = 72$

$5x^2 - 31x = 72$

$5x^2 - 31x - 72 = 0$

$\frac{31 \pm \sqrt{31^2 - 4(5)(-72)}}{2(5)}$

$\frac{31 \pm \sqrt{2401}}{10} = \frac{31 \pm 49}{10}$

$\frac{31 + 49}{10} \rightarrow \boxed{x = 8}$

$\frac{31 - 49}{10} \rightarrow x = -1.8$

$\boxed{\begin{array}{l}\text{width} = 8 \text{ cm} \\ \text{length} = 5(8) - 31 = 9 \text{ cm}\end{array}}$