



Unit 2: Complete the Square and Gravity problems.

Complete the Square

1.  $v = x^2 + 6x - 4$

$9 + y + 4 = x^2 + 6x + 9$   
 $y = (x+3)^2 - 13$

2.  $f(x) = x^2 + 12x - 1$

$36 + f(x) + 1 = x^2 + 12x + 36$   
 $f(x) = (x+6)^2 - 37$

3.  $g(x) = x^2 - 14x + 3$

$+49 + g(x) - 3 = x^2 - 14x + 49$   
 $g(x) = (x-7)^2 - 46$

4.  $v = 2x^2 + 20x - 8$

$2(25) + y + 8 = 2(x^2 + 10x + 25)$   
 $y = 2(x+5)^2 - 58$

5.  $h(x) = 3x^2 + 6x - 15$

$3(1) + h(x) + 15 = 3(x^2 + 2x + 1)$   
 $h(x) = 3(x+1)^2 - 18$

6.  $v = 2x^2 + 2x - 3$

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

Answer these for the following questions

- a. Write an equation.
- b. What time is the diver at the max height?
- c. What is the max height?
- d. When does the diver hit the ground?
- e. What is the average velocity between  $t=0$  and  $t=0.1$ ? Use slope....

7. A diver jumps from the 10 foot board with an initial vertical velocity of 12 feet per second.

a)  $y = -16t^2 + 12t + 10$

b)  $t = \frac{-12}{2(-16)} = \frac{3}{8} \text{ sec} = .375 \text{ s}$

c)  $y(3/8) = -16(9/64) + 12(3/8) + 10 = 12.25 \text{ ft}$

d)  $0 = -2(8t^2 - 6t - 5)$  or QF  $t = \frac{6 \pm \sqrt{36 - 4(8)(-5)}}{2(8)}$

e)  $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{11.04 - 10}{.1 - 0} = \frac{1.04}{.1} = 10.4 \text{ ft/s}$

1.25 sec,  
~~0~~ not real in this situation

8. An object is thrown down from an airplane at 3000 meters with an initial vertical velocity of -8 meters per second.

a)  $y = -4.9t^2 - 8t + 3000$

b) max at  $t=0$  sec in this situation

c) 3000 meters.

d)  $t = 23.94 \text{ seconds}$

e)  $m = \frac{2999.151 - 3000}{.1} = -9.849 \text{ m/s}$

9. A baseball is hit with an initial vertical velocity of 64 feet per second from 3 feet.

a)  $y = -16t^2 + 64t + 3$

b)  $t = 2 \text{ sec}$

c) 67 feet

d)  $t = 4.1046 \text{ sec}$

e)  $\frac{9.24 - 3}{.1 - 0} = 62.4 \text{ ft/s}$

10. An arrow is shot from 4 meters with an initial vertical velocity of -2 meters per second.

a)  $y = -4.9t^2 - 2t + 4$

b) Max  $t=0 \text{ sec}$

c) 4 meters

d) .722 sec.

e)  $\frac{3.757 - 4}{.1 - 0} = -2.49 \text{ m/s}$