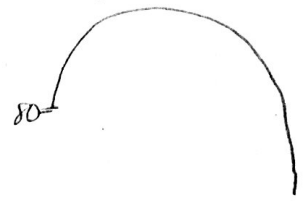
5. A rocket carrying fireworks is launched from a hill 80 feet above a lake. The rocket will fall into lake after exploding at its maximum height. The rocket's height above the surface of the lake is given by $h(t) = -16t^2 + 64t + 80$.



a. What is the height of the rocket after 1.5 seconds?

$-16(1.5)^2 + 64(1.5) + 80$

$-36 + 96 + 80 = 140$ feet

b. What is the maximum height reached by the rocket?

$\frac{-b}{2a} = \frac{-64}{2(-16)} = \frac{-64}{-32} = 2$

$-16(2)^2 + 64(2) + 80$

$-64 + 128 + 80$

144

144 feet

c. How long will it take for the rocket to hit 128 feet?

$128 = -16t^2 + 64t + 80$

$-16t^2 + 64t - 48 = 0$

$-16(t^2 - 4t + 3) = 0$

$-16(t-1)(t-3) = 0$

$t = 1 \quad t = 3$

1 sec 3 sec

d. After how many seconds after it is launched will the rocket hit the lake?

$-16t^2 + 64t + 80 = 0$

$-16(t^2 - 4t - 5) = 0$

$-16(t-5)(t+4) = 0$

$t = 5$ ~~$t = -4$~~

5 sec

6. A rock is thrown from the top of a tall building. The distance, in feet, between the rock and the ground t seconds after it is thrown is given by $d = -16t^2 - 4t + 382$. How long after the rock is thrown is it 370 feet from the ground?

$370 = -16t^2 - 4t + 382$

$-16t^2 - 4t + 12 = 0$

$-4(4t^2 + 1t - 3) = 0$

$(4t - 3)(t + 1) = 0$

$4t = 3 \quad$ ~~$t = -1$~~

$t = 3/4$ sec

7. The revenue for a production by a theatre group is $y = -50t^2 + 300t$, where t is the ticket price in dollars. The cost for the production is $y = 600 - 50t$. Determine the ticket price that will allow the production to break even. BEP is when revenue = cost.

$-50t^2 + 300t = 600 - 50t$

$-50(4)^2 + 300(4)$ $\quad 600 - 50(4)$

$-800 + 1200$ $\quad 600 - 200$

400 $\quad$ 400

$0 = 50t^2 - 350t + 600$

$50(t^2 - 7t + 12) = 0$

$(t-4)(t-3) = 0$

$-50(3)^2 + 300(3)$ $\quad 600 - 50(3)$

$-450 + 900$ $\quad 600 - 150$

450 $\quad$ 450

$(t = 4) \quad (t = 3)$