Applications

8. The profit $P$ (in hundreds of $\$) that a company makes depends on the amount $x$ (in undress of $\$) the company spends on advertising can be modeled by:

$$P = 230 + 20x - 0.5x^2$$

What should the company spend on advertising and what is their maximum profit?

- **Finding vertex**
  - $P = -0.5x^2 + 20x + 230$
  - $P = -0.5(20)^2 + 20(20) + 230$
  - $P = 430$ (for profit
  - Use $x = \frac{-b}{2a}$
  - $x = 20$
  - They should spend $\$2,000 on ads to make a max profit of $\$43,000.

9. The height of a ball thrown off the top of the building can be modeled by

$$h = -16t^2 + 32t + 40$$

where $h$ is height in feet and $t$ is time in seconds.

- **a. How tall was the building?**
  - $h = -16(0)^2 + 32(0) + 40$
  - $h = 40$ ft

- **b. What was the maximum height of the ball?**
  - $h = -16(1)^2 + 32(1) + 40$
  - $h = 56$ ft

- **c. When did the ball hit the ground?**
  - $-16t^2 + 32t + 40 = 0$
  - $4t^2 - 8t - 10 = 0$
  - $t = \frac{8 \pm \sqrt{(-8)^2 - 4(4)(-10)}}{2(4)}$
  - $t = \frac{8 \pm \sqrt{224}}{8}$
  - $t = 2.871$ seconds