

## Answer on Question #55824 – Math – Algebra

**Task 7.** The average income,  $I$ , in dollars, of a lawyer with an age of  $x$  years is modeled with the following function:  $I = -425x^2 + 45,500x - 650,000$ . What is the youngest age for which the average income of a lawyer is \$450,000? Round answer to nearest year.

### Solution

Solve the following equation:

$$-425x^2 + 45,500x - 650,000 = 450,000 \Leftrightarrow -425x^2 + 45,500x - 1,100,000 = 0$$

Divide both sides of the equation by -25:

$$17x^2 - 1820x + 44,000 = 0$$

Using formulas for quadratic equation, we get:

$$x_1 = \frac{1820 + \sqrt{1820^2 - 4 \cdot 17 \cdot 44,000}}{2 \cdot 17} = \frac{1820 + \sqrt{320400}}{34} \approx 70$$
$$x_2 = \frac{1820 - \sqrt{1820^2 - 4 \cdot 17 \cdot 44,000}}{2 \cdot 17} = \frac{1820 - \sqrt{320400}}{34} \approx 37$$

**Answer:** 37 years.

**Task 8.** The average annual income,  $I$ , in dollars of a lawyer with an age of  $x$  years is modeled with the following function:  $I = -425x^2 + 45,500x - 650,000$ . According to this model, what is the maximum average annual income in dollars, a lawyer can earn? Round to the nearest whole dollar.

### Solution

Consider function:

$$I = f(x) = -425x^2 + 45,500x - 650,000$$

This is a parabola. Using formula for the vertex of a parabola, we get:

$$x_{vertex} = -\frac{b}{2a} = -\frac{45500}{2 \cdot (-425)} \approx 53.5$$

Then, find  $y_{vertex}$ :

$$y_{vertex} = f(x_{vertex}) = -\frac{D}{4a} = -\frac{45,500^2 - 4 \cdot (-425) \cdot (-650,000)}{4 \cdot (-425)} \approx 567,794$$

**Answer:** \$567,794.