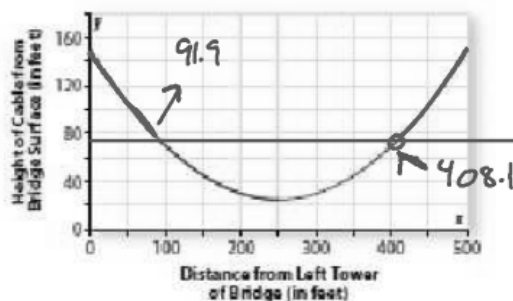


What you will learn about:

Suspension Bridges: Some of the longest bridges in the world are suspended from cables that hang in parabolic arcs between towers. One of the most famous suspension bridges is the Golden Gate Bridge in San Francisco, CA.



1. Use the function $y = 0.002x^2 - x + 150$ to answer the following questions.

a. What is the approximate height (from the bridge surface) of the towers from which the cable is suspended?

b. What is the shortest distance from the cable to the bridge surface, and where does it occur?

25 ft @ 250 ft from left tower

c. For what interval(s) is the suspension cable 75 feet above the bridge surface?

$0 \leq x < 91.9$ OR $408.1 < x \leq 500$

Fundraising: Suppose that a group of students decided to organize a local event.

- The relationship between number of tickets sold s and price x in dollars can be approximated by the linear equation $s = 4,000 - 250x$.
- Expenses for promoting and operating the concert will include \$1,000 for advertising and \$3,000 for pavilion rental, \$1,500 for security, and \$2,000 for catering and event T-shirts for volunteer staff and band members.

a. Find a function that can be used to predict income I for any ticket price x .

$$I(x) = x(4000 - 250x)$$

$$-250x^2 + 4000x$$

b. Find a function that can be ^{used} ~~sued~~ to predict profit P for any ticket price x .

$$P(x) = \text{Income} - \text{Expenses}$$

$$P(x) = -250x^2 + 4000x - 7500$$

c. What ticket price(s) seem likely to give maximum income and maximum profit for the concert? What are those maximum income and profit values? How many tickets will be sold at the price(s) that maximize income and profit?

$$\text{Profit } \$8 \quad \$8500$$

Sell 2000 tickets

$$\text{Income } \$8 \quad \$16,000$$

d. If event planners are more interested in attracting a large audience without losing money on the event than in maximizing profit, what range of ticket prices should they consider? Explain your reasoning.

$$\$2.20 \leq x \leq \$8$$

The **Break-even point** is the ticket price for which the event's income will equal expenses. Another way to think of the break-even point is the ticket price when profit is zero.

a. Write and solve an equation that can be used to find the break-even ticket price for this particular planned concert. $I(x) = E_{xp}$

$$-250x^2 + 4000x - 7500 = 0$$

$$-250x^2 + 4000x = 7500$$

$$x = \$2.17 \quad \$13.83$$

b. Write and solve an inequality that can be used to find ticket prices for which the planned concert will make a positive profit.

$$-250x^2 + 4000x - 7500 > 0$$

$$2.17 < x < 13.83$$

$$2.17 < x < 13.83$$

c. Write and solve an inequality that can be used to find ticket prices for which the planned concert will lose money.