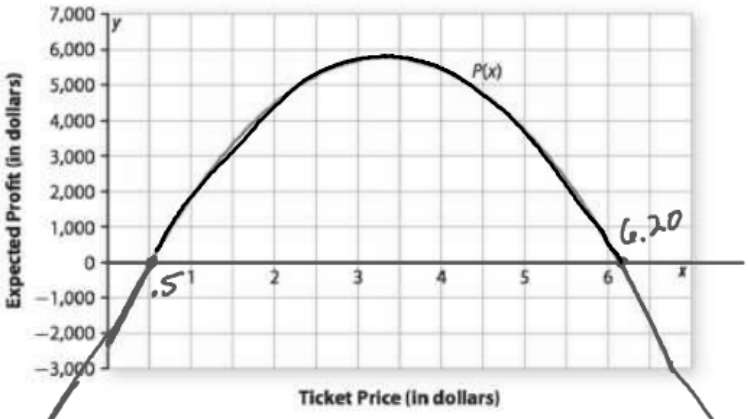
What you will learn about:
Inequalities in One Variable

1. Suppose that plans for a fundraising raffle shows that profit P will depend on ticket price x according to the function $P(x) = -2{,}500 + 5{,}000x - 750x^2$. A graph of profit as a function of ticket price is shown here.

Raffle Fundraiser Profit



a. Use the graph to estimate solutions of the inequalities.

i. $-2{,}500 + 5{,}000x - 750x^2 > 0$

$.50 < x < 6.20$

$(.5, 6.20)$

ii. $P(x) < 0$

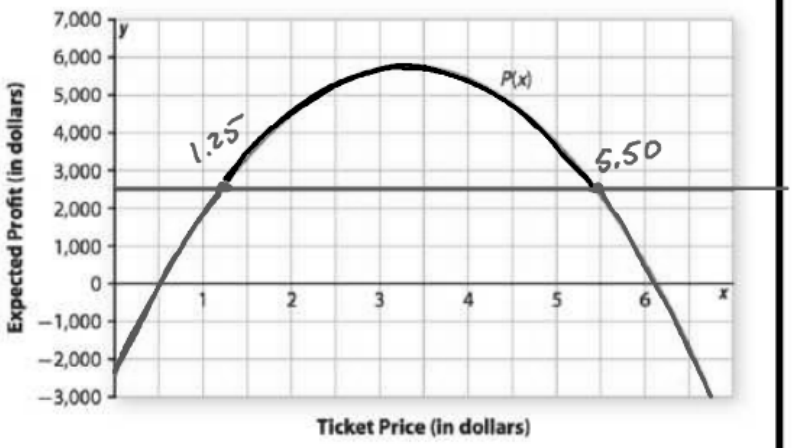
$0 \leq x < .5 \quad \text{or} \quad x > 6.20$

$[0, .5) \cup (6.2, \infty)$

Interval Notation

6

2. If the fund raising event wants to raise $2,500 use the graph to answer the following questions.



a. What ticket price will give you a profit of exactly $2,500?

$X = \$1.25$

$\$5.50$

b. What ticket price(s) will yield a profit greater than $2,500?

i. Symbolic Notation

$1.25 < x < 5.50$

ii. Interval Notation

$(1.25, 5.50)$

c. What ticket price(s) will yield a profit less than the target amount?

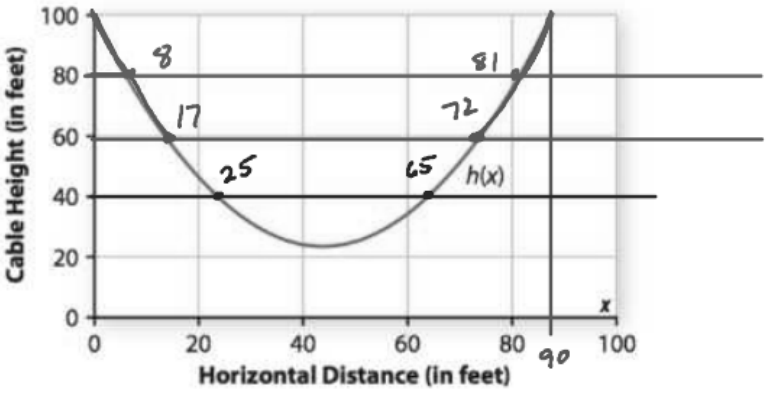
i. Symbolic Notation

$0 \leq x < 1.25$ or $x > 5.50$

ii. Interval Notation

$[0, 1.25) \cup (5.50, \infty)$

3. The next graph shows the height of the main support cable on a suspension bridge. The function defining the curve is $h(x) = 0.04x^2 - 3.5x + 100$, where x is horizontal distance (in feet) from the left end of the bridge and *h(x)* is the height (in feet) of the cable above the bridge surface.



For questions in Parts a-d:

- Write an algebraic calculation, equation, or inequality whose solution will provide an answer to the question.
- Then use the graph above to estimate the solution and calculator tables and graphs of *h(x)* to sharpen the accuracy to the nearest tenth.
- Express your answer with a symbolic expression and (where appropriate) a number line graph.

a. Where is the bridge cable less than 40 feet above the bridge surface?

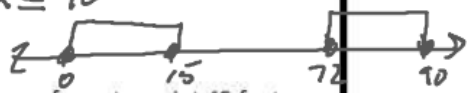
- $.04x^2 - 3.5x + 100 < 40$
- $x > 25$ and $x < 65$ $\quad 25 < x < 65$

$(25, 65)$

b. Where is the bridge cable at least 60 feet above the bridge surface?

- $0.04x^2 - 3.5x + 100 \geq 60$
- $0 \leq x \leq 15$ or $72 \leq x \leq 90$

$[0, 15] \cup [72, 90]$



c. How far is the cable above the bridge surface at a point 45 feet from the left end?

$$h(45) = .04(45)^2 - 3.5(45) + 100$$
$$= 23.5 \text{ ft}$$

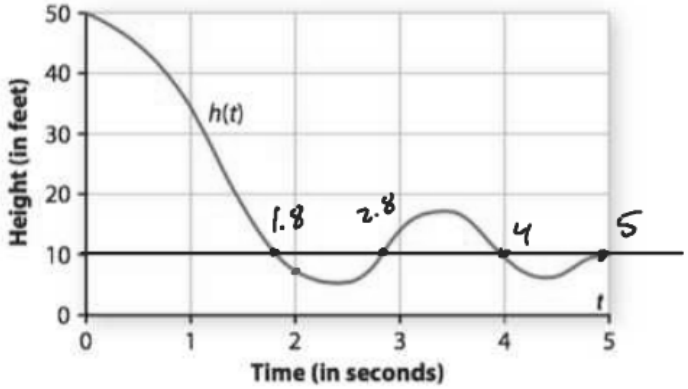
$0 \le x < 8$ or $81 < x \le 90$

d. Where is the cable 80 feet above the bridge surface?

- $0.04x^2 - 3.5x + 100 > 80$

$[0, 8) \cup (81, 90]$

4. The graph below shows the height of a bungee jumpers head above the ground at various times during ride on the elastic bungee cord. Suppose that *h(t)* gives height in feet as a function of time in seconds.



For each part a-d:

- Write a question about the bungee jump that can be answered by the indicated mathematical operation.
- Use the graph to estimate the answer.
- Express your answer (where appropriate) with a number line graph.

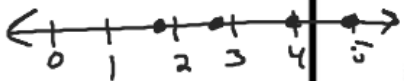
a. Evaluate *h(2)*.

- What is the height of the bungee jumpers head after 2 seconds.
- $h(2) = 8$ ft

b. Solve $h(t) = 10$.

- At what times is the bungee jumpers head 10 ft of the ground

$t = 1.8, 2.8, 4, 5$



c. Solve $h(t) \ge 10$.

At what times is the bungee jumpers head at least 10 ft.

d. Solve $h(t) < 10$.