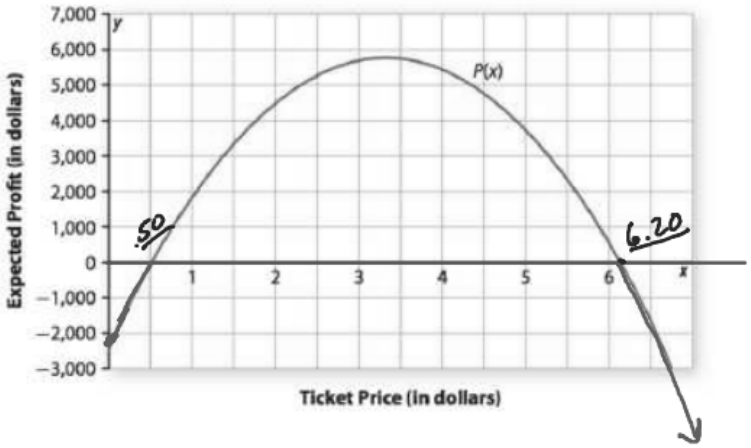
What you will learn about:
Inequalities in One Variable

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

$.5 < x < 6.20$

$(.5, 6.20)$

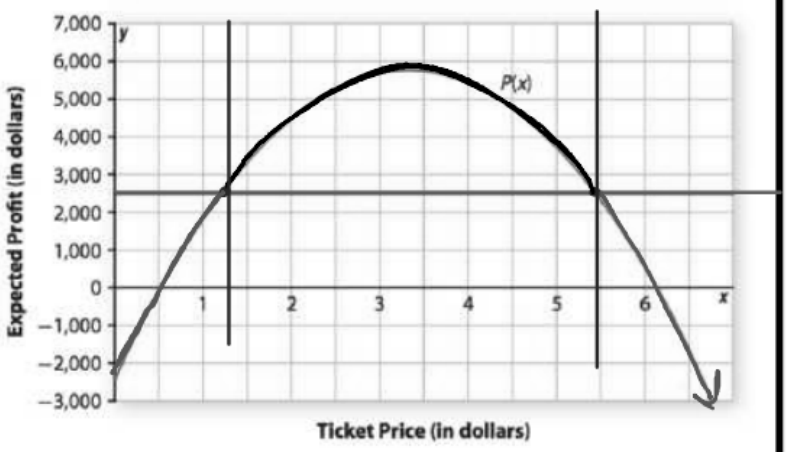
ii. $P(x) < 0$

$[0, .50) \cup (6.2, \infty)$

$0 \leq x < .5$ or $x > 6.20$

Interval Notation

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?

$x = \$1.25, \$5.45$

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

i. Symbolic Notation $\leq \geq < >$

$1.25 < x < 5.45$

ii. Interval Notation [ ] ( ) [ ) ( ]

$(1.25, 5.45)$

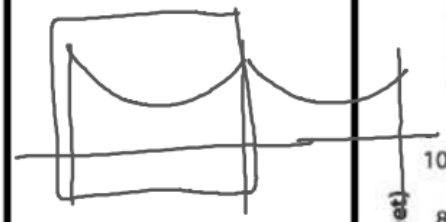
c. What ticket price(s) will yield a profit less than the target amount?

i. Symbolic Notation

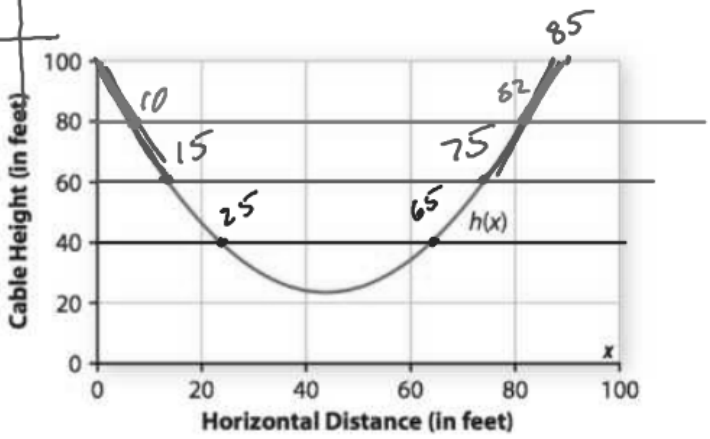
$0 \leq x < 1.25$ or $x > 5.45$

ii. Interval Notation

$[0, 1.25) \cup (5.45, \infty)$



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?

$.04x^2 - 3.5x + 100 < 40$

$25 < x < 65$

$(25, 65)$

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

$.04x^2 - 3.5x + 100 \geq 60$

$0 \leq x \leq 15$ or $75 \leq x \leq 85$

$[0, 15] \cup [75, 85]$

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

$.04(45)^2 - 3.5(45) + 100$

23.5

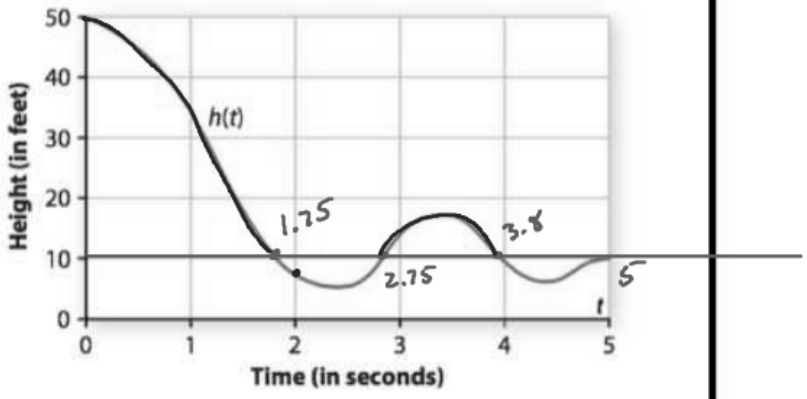
d. Where is the cable 80 feet above the bridge surface?

$.04x^2 - 3.5x + 100 > 80$

$0 \le x < 10$ or $82 < x \le 85$

$[0, 10) \cup (82, 85]$

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.



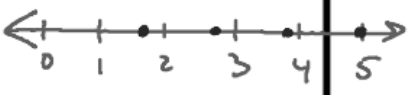
For each part a-d:

- 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)*.

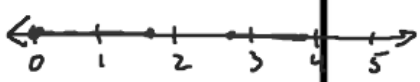
- What is the height of the bungee jumpers head after 2 seconds?
- About 7 ft

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



At what times is the bungee jumpers head 10 ft above ground

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



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

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