What's Going On?

Checking In Homework Logs

Minds on Maximum or Minimum?

Action! Maximum and Minimum Values

Consolidation A Stone's Throw

Learning Goal - I will be able to determine the maximum and minimum values of a quadratic using multiple methods.

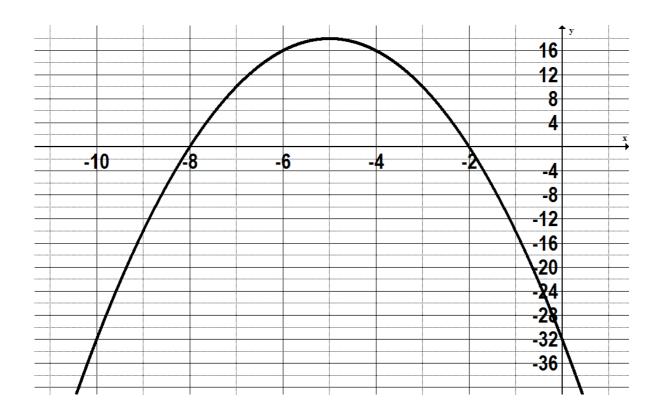
Checking In

LGL

A quadratic function has these characteristics:

- Axis of symmetry is x = -5
- x = -8 is an x-intercept
- Goes through the point (-9, -1/4)

Determine the y-intercept of this parabola



RECYCLING!

Checking In

Your Textbook, Online, For FREE!

Google Search: Functions 11 Nelson

http://mrsirwinhamilton.wikispaces.com/file/view/Nelson+Functions+11.pdf



P.S. I never told you about this. You were googling our course for extra help and happened to find this.

Minds on

Maximum or Minimum?

For each quadratic, identify if it has a maximum value, or a minimum value.

Minds on

Maximum or Minimum?





$$f(x) = -3(x + 5)^2 - 1$$



$$f(x) = 2(x + 1)(x - 3)$$

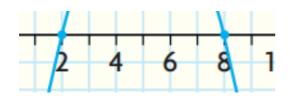


$$f(x) = -x^2 + 99$$



A parabola with a vertex at (5, 18) and zeros at x = 2, and x = 8.







Maximum / Minimum Values



To find maximum and minimum values of a quadratic, we need the vertex. If we are given a standard form equation, we can:

- A. Complete the square to get vertex form
- B. Find the factored form and then determine the vertex.
- C. Find two symmetrical points and then determine the vertex.
- D. Use the quadratic formula to find the zeros, then determine the vertex.

Maximum / Minimum Values

A. Complete the square to get vertex form

$$h(t) = -5t^{2} + 40t + 100$$

$$= -5(t^{2} - 9t) + 100$$

$$= -5(t^{2} - 9t + 16 - 16) + 100$$

$$= -5(t - 4)^{2} - 16 + 100$$

$$= -5(t - 4)^{2} + 40t + 100$$

Maximum / Minimum Values

B. Find the factored form and then determine the vertex.

$$h(t) = -5t^{2} + 40t + 100$$

$$= -5(t^{2} - 9t - 20)$$

$$) = -10t + 100$$

$$2 = -10t + 100$$

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$$h = -5(01-1)(++2)$$

$$= -5(4-10)(4+2)$$

$$= -5(-6)(6)$$

$$= 180$$

Maximum / Minimum Values

C. Find two symmetrical points and then determine the vertex.

$$h(t) = -5t^2 + 40t + 100$$

 $h(t) = -5t(t-4) + 100$
When $t = 0$, $h = 100$
When $t = 4$, $h = 100$
Axis of Symmetry is $0+4$ = 4
 $h(4) = -5(4)^2 + 40(4) + 100$
 $= -80 + 160 + 100$
 $= (40)^2 + 40(4) + 100$

Maximum / Minimum Values

D. Use the quadratic formula to find the zeros, then determine the vertex.

$$b = \frac{1}{10} = \frac{1}{$$

Profit Models

Quadratics are commonly used as profit models.

The basic idea behind this is that when you first start a business, as your sales increase your profits increase at a rapid rate.

However, you eventually hit a point where you can no longer meet demand. At this point you need to hire more employees, invest in real estate or other capital projects. When you get here, your profits decrease.

Profit Models

When we discuss profit models we have

A Cost Function: C(x)

A Demand Function: p(x)

The number of units sold: (x)

The Revenue Function: [p(x)](x)

A Profit Function: Revenue — Cost

[p(x)](x) - C(x)

Profit Models

Example

The demand function for a new magazine is p(x) = -6x + 40, where p(x) represents the selling price, in thousands of dollars, of the magazine and x is the number sold, in thousands. The cost function if C(x) = 4x + 48. Calculate the maximum profit and the number of magazines sold that will produce the maximum profit.

Revenue function
$$(P(X))(X)$$

 $P(X) = (-bx + 40)(X)$
 $= -bx^2 + 40X$

$$P(x) = R(x) - C(x)$$

$$= (-6x^2 + 40x) - (4x + 48)$$

$$= -6x^2 + 40x - 4x - 48$$

$$= -6x^2 + 36x - 48$$
Factor or Complete the Square or
Sind two points or quadratic formula.

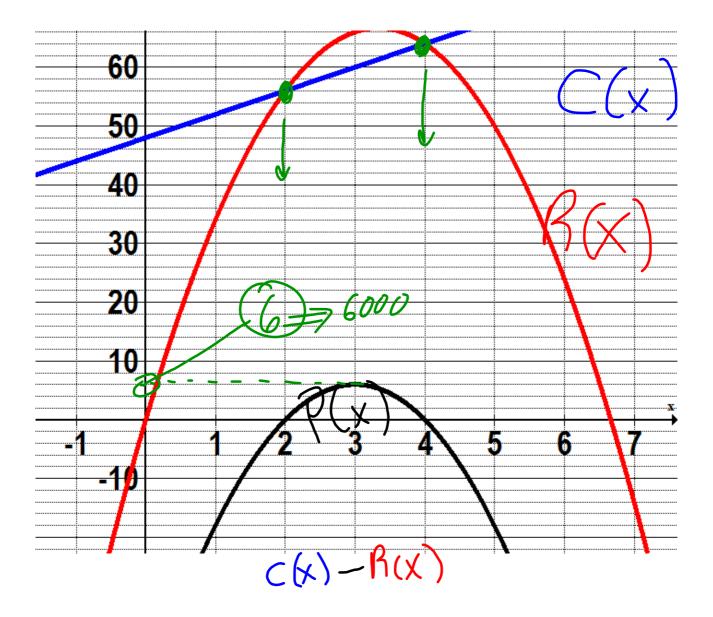
$$= -6x^{2} + 36x - 48$$
Factor or Conplete the Square or Six two points of Evatratic formula!
$$P(x) = -6(x^{2} - 6x) - 48$$

$$= -6(x^{2} - 6x + 9 - 9) - 48$$

$$= -6(x - 3)^{2} - 9 - 48$$

$$= -6(x - 3)^{2} + 54 - 48$$

$$= -6(x - 3)^{2} + 6$$
Max profit is \$6000!



A Stone's Throw

A stone is thrown into the air from a bridge, over a river. It falls into the river.

The height of the stone, h metres, above the water t seconds after thrown is modelled by the equation: $h(t) = -5t^2 + 10t + 7$.

- a. How high is the bridge? $\frac{1}{2}$
- b. How long does it take the stone to hit the water?
- c. What is the maximum height reached by the stone, and when does this occur?
- d. Determine the domain and range of the function in this situation.

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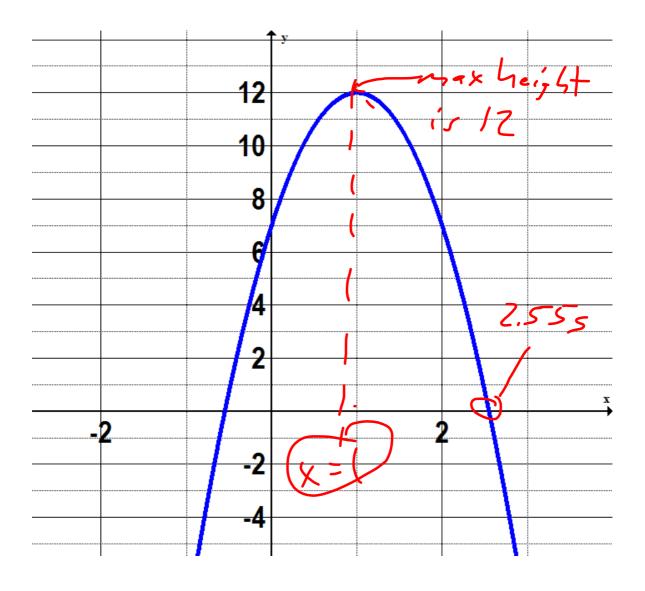
b. How long does it take the stone to hit the water? Find 2

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We need to think about it in context.

Time starty at 0! Londs after 2.555...

Et & B| O et < 2.553

Helpt nex is 12m, min is On

Although the stone, technically, would sink and therefore go into negative values of height. However, the water will change the course of the stone and our quadratic model will fall apart.

Therefore, we stop considering the stone when it hits the water.

Homework



TEXTBOOK.pdf