

Math 20-2

Name: _____

Quadratic Word Problems

1. The path of the ball for many golf shots can be modeled by a quadratic function. The path of a golf ball hit at an angle of about 10° to the horizontal can be modeled by the function $h(d) = -0.002d^2 + 0.4d$, where $h(d)$ is the height of the ball, in metres, and d is the horizontal distance the ball travels, in metres, until it first hits the ground.

Window/Sketch:

$x =$ golf ball distance $[-20, 300, 100]$
 $y =$ golf ball height $[-10, 50, 10]$

} show some negative to calculate "zero"

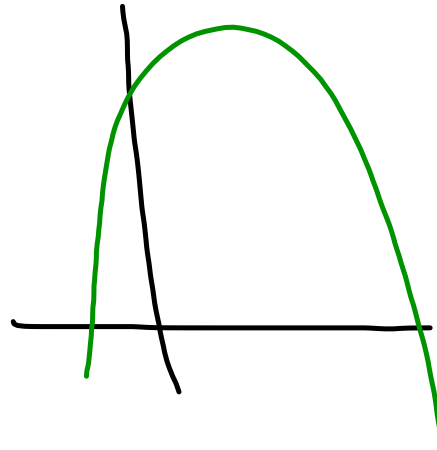
- a) What is the maximum height reached by the ball?
- CALC MAX*
 $x =$ $y =$
- \rightarrow y-value
- b) What is the horizontal distance of the ball from the golfer when the ball reaches its maximum height?
- \rightarrow x-value

- c) What distance does the ball travel horizontally until it first hits the ground?
- height is ZERO
- CALC ZERO*
 $x =$ $y =$
- distance = x value

2. The top of Harbour Centre, the tallest building in Vancouver, is 146 m above the ground. Suppose an object were thrown upward with an initial velocity of 24.5 m/s from this height. The height of the object above the ground, $h(t)$ metres, t seconds after being thrown, would be given by the equation $h(t) = -4.9t^2 + 24.5t + 146$

Window/Sketch:

X: time ... some negative ...
 Y: start 146m ... hit ground
 X: $[-2, 10, 1]$
 Y: $[-20, 200, 10]$



- a) What would be the maximum height of the object above the ground, to the nearest tenth of a metre?

CALC MAX
 $x = 2.5$ $y = 176.625$

176.6 m

- b) From the time the object was thrown, how many seconds would it take to reach the ground, to the nearest tenth of a second?

CALC
 ZERO

$x = 8.5$ $y = 0$

8.5 seconds

3. An amusement park charges \$8 admission and averages 2000 visitors per day. A survey shows that, for each \$1 increase in the admission cost, 100 fewer people would visit the park.

a) Use the table to show the pattern between park admission charges and visitors per day. Find the revenue for the park.

L1	Admission	8	9	10	11	12
	Visitors	2000	1900	1800	1700	1600
L2	Revenue	16000	17100	18000	18700	19200

TI 83/84
STAT
EDIT

b) Write an equation to express the revenue.
 • Method one: Quad Regression
 • Method two: Algebraic Function relating the Revenue to each price increase of x dollars.

$a = -100$
 $b = 2800$
 $c = 0$
 c) Window/Sketch

STAT → CALC
 ↓
 QUAD REG

$$y = -100x^2 + 2800x + 0$$

X: Admission PRICE ... some negative and more than 12 ...

Y: Revenue ... some negative and more than 19000 ... another 10 or 20 thousand.

d) Find the coordinates of the maximum point of this function.

e) What admission cost gives the maximum revenue?

f) How many visitors give the maximum revenue?

4. A company that provides heli-skiing charges \$100 per person per run. At this price, they take 50 skiers each week to the top of the mountain. They estimate they will lose 2 customers for each \$10 increase.

a) Determine a revenue equation.

QUAD
 $a = -0.2$
 $b = 70$
 $c = 0$
 $y = -0.2x^2 + 70x + 0$

b) What price should be charged for maximum revenue?

$x = \text{price} \dots$ zero to more than 130

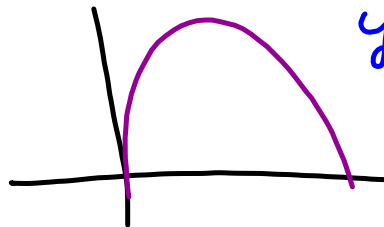
$y = \text{revenue} \dots$ zero to more than 57000

L ₁ PRICE	L ₂ (Revenue)
100	100 x 50 = 5000
110	110 x 48 = 5280
120	120 x 46 = 5520
130	130 x 44 = 5720

$x: [0, 400, 100]$

$y: [0, 10000, 1000]$

c) How many skiers is this? What is the maximum revenue?



5. The Environmental Club sells sweatshirts as a fund-raiser. They sell 1200 shirts a year at \$20 each. They are planning to increase the price. A survey indicates that, for every \$2 increase in price, there will be a drop of 60 sales a year. What should the selling price be in order to maximize the revenue?