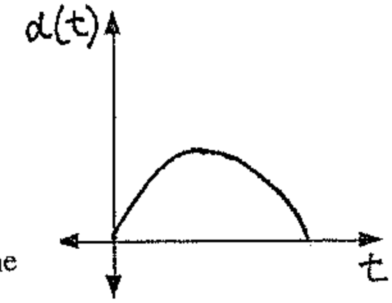
Assignment

1. A football punted during a high school football game followed the path of a parabola. The path can be modelled by the function

$$d(t) = -5t^2 + 15t + 1, \ t \geq 0$$

where t is the number of seconds which have elapsed since the football was punted, and $d(t)$ is the number of metres above the ground after t seconds.

a) Sketch the graph on the grid.



In the following questions, answer to the nearest hundredth of a unit where necessary.

b) What was the height of the football above the ground as the punter made contact with the football?

$t = 0$, $d = 1$ height = 1 metre

c) What was the height of the football above the ground 1 second after contact?

$t = 1$, $d = -5(1)^2 + 15(1) + 1 = 11$ or by graphing calculator height = 11 metres

d) What is the maximum height reached by the football? What relation does this have to the vertex of the parabola?

12.25 metres. It is the y-coordinate of the vertex.

e) How many seconds had elapsed when the football reached its maximum height? What relation does this have to the vertex?

1.50 seconds. It is the x-coordinate of the vertex.

f) The punt was not fielded by the opposition and the football hit the ground. How many seconds did it take for the football to hit the ground?

$d(t) = 0$ 3.07 seconds

g) The original domain was given as $t \geq 0$.
Write a more accurate domain for the function which describes the path of the football.

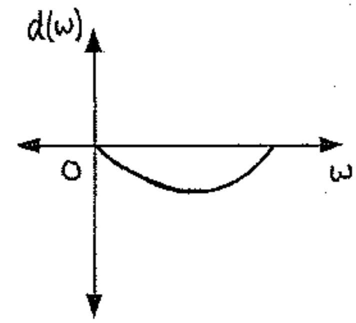
$\{t \mid 0 \leq t \leq 3.07, t \in R\}$

2. The cross section of a river, from one bank to the other, can be represented by the function

$$d(w) = \frac{1}{14}w^2 - \frac{5}{7}w$$

where $d(w)$ is the depth, in metres, of the river w metres from the left edge of the river bank.

a) Sketch the graph of the cross section of the river using a graphing calculator.



b) Determine the depth of the river 3 metres from the left edge.

w = 3 depth = 1.5 metres

c) What is the maximum depth of the river, to the nearest hundredth of a metre?

min. value of d(w). max. depth = 1.79 metres

d) How far from the left edge of the river, to the nearest tenth of a metre, is the deepest part of the river?

5.0 metres

e) What is the width of the river to the nearest tenth of a metre?

d(w) = 0 width = 10.0 metres

3. Recall the following information from Class Ex. #2 on page 324.

The hockey club had 7 200 season ticket holders who each paid $1 400 for a package of season tickets. The owner had suggested raising the price to generate more revenue, but knew that the number of season ticket holders would be reduced.

The general manager suggested that more revenue might be obtained by decreasing the price and thus attracting more fans to buy a package of season tickets. The research company, that the owner hired to explore the general manager's suggestion, reported that for every $50 decrease in price, approximately 400 new season ticket holders would be generated.

a) If the price decrease is to be a multiple of $50, determine the following.

i) The price of a package of season tickets which would generate maximum revenue.

Let x = number of $50 decreases

cost = $(1400 - 50x)

tickets = 7200 + 400x

revenue = $(1400 - 50x)(7200 + 400x)

graph y = (1400 - 50x)(7200 + 400x)

find maximum. → x = 5

price = 1400 - 50(5) = $1150

ii) The number of season ticket holders which would be generated.

7200 + 400(5) = 9200

iii) The revenue which would be generated if the plan in a) was implemented.

$1150 × 9200 = $10 580 000

b) What advice would you give the owner in regards to the direction he should take to obtain maximum revenue?

It would be better to reduce the price to $1150 than to increase to $1600.