

6. The power,  $P$  watts, supplied to a circuit by a 9-V battery is given by the formula  $P = 9I - 0.5I^2$ , where  $I$  is the current in amperes.

a) Graph  $P$  against  $I$ .

b) For what value of the current will the power be a maximum? *9 amperes*

c) What is the maximum power? *40 W*

7. A rectangular lot is bounded on one side by a river and on the other three sides by a total of 30 m of fencing. A formula that represents the area of the lot,  $A$  square metres, in terms of its width,  $x$  metres, is  $A = 30x - 2x^2$ . Calculate the dimensions of the largest possible lot.

*(15 x 7.5) ✓*

8. Computer software programs are sold to students for \$20 each. Three hundred students are willing to buy them at this price. For every \$5 increase in price, there are 30 fewer students willing to buy the software. A formula that represents the revenue,  $R$  dollars, for an  $x$  dollar increase in price is  $R = -6x^2 + 180x + 6000$ . Calculate the selling price that will produce the maximum revenue. What is the maximum revenue?

*\$20  
\$7200*

9. Forty metres of fencing are available to enclose a rectangular pen. The area,  $A$  square metres, enclosed is given by  $A = 20x - x^2$ , where the length of the pen is  $x$  metres.

a) What is the maximum area that can be enclosed? *100*

b) What are the dimensions of the pen with maximum area? *10 x 10*

c) What dimensions produce a pen with an area greater than 90 m<sup>2</sup>? *3.7 ≤ x ≤ 16  
one side*

10. A company manufactures and sells designer T-shirts. The profit,  $P$  dollars, for selling a certain style of T-shirt is projected to be  $P = -20x^2 + 1000x - 6720$ , where  $x$  dollars is the selling price of one T-shirt.

a) Sketch a graph of  $P$  against  $x$ . *25*

b) What selling price gives the maximum profit? What is the maximum profit? *5780*

c) The company hopes to earn a profit of more than \$6000 on this style of T-shirt. Based on its projections, is this possible? *No*

d) What do the  $x$ - and  $P$ -intercepts of the graph represent?

*x - break even  
P - start up cost*

11. An archway has been built over a road. The arch can be modelled by the function

$y = -\frac{4}{9}x^2 + \frac{8}{3}x$ . A truck is 2 m wide and must drive under this arch.

a) Graph the function  $y = -\frac{4}{9}x^2 + \frac{8}{3}x$ .

*y = height  
x = dist from left curb*

b) Describe what  $x$  and  $y$  represent in this situation.

c) Determine the coordinates of the vertex of the graph.

*(3, 4)*

d) What is the maximum possible height of the truck? Explain.

*height  
at x=2, 4  
3.5m*