

The price p (in dollars) and the quantity x sold of a certain product obey the demand equation $p = -\frac{2}{5}x + 500$.

a. Find a model that expresses the revenue R as a function of x .

$$R = xp \rightarrow R(x) = -\frac{2}{5}x^2 + 500x$$

b. What is the revenue if 300 units are sold.

$$R(300) = -\frac{2}{5}(300)^2 + 500(300) = \$114,000$$

c. What quantity x maximizes revenue? What is the maximum revenue?

$$\frac{-b}{2a} = \frac{-500}{2(-\frac{2}{5})} = 625$$

$$R(625) = \$156,250$$

d. What price should the company charge to maximize revenue?

$$p(625) = \$250$$

10. A biologist would like to know how the age of the mother affects the incidence rate of Down syndrome. The data to the right represent the age of the mother and the incidence rate of Down syndrome per 1000 pregnancies.

a. Create a scatter diagram in your calculator treating age of the mother as the independent variable. Would it make sense to find the line of best fit for these data or quadratic regression equation?

b. Find the best model to fit the data using your calculator.

$$y = .35x^2 - 24.5x + 427.35$$

c. Use your model to estimate the incidence of Down Syndrome if the age of the mother is 25. Round to the nearest tenth.

$$f(25) = 33.6$$



Age of Mother, x	Incidence of Down Syndrome, y
32	2.1
34	3.0
36	3.9
36	4.9
37	6.7
39	8.3
40	10.1
40	13.2
41	16.6
43	22.2
43	27.6
44	33.3
46	50

Source: Hook, E.B., *Journal of the American Medical Association*, 249, 2034-2038, 1983.

Extra Credit!

For the following functions: $f(x) = x^2 - x - 4$ and $g(x) = x^2 + x - 4$ find indicated inequality solution set.

a. $f(x) = g(x)$

$$x^2 - x - 4 = x^2 + x - 4$$

$$-x - 4 = x - 4$$

$$+x + 4 \quad +x + 4$$

$$0 = 2x$$

$$x = 0$$

b. $f(x) < g(x)$

$$x^2 - x - 4 < x^2 + x - 4$$

$$-x - 4 < x - 4$$

$$0 < 2x$$

$$0 < x$$