Math 151
Section 1.2

Modeling

A mathematical model is a mathematical description (often by the means of a function or equation) of a real-world phenomenon such as size of population, chemical reaction, the demand of a product, or the speed of an object

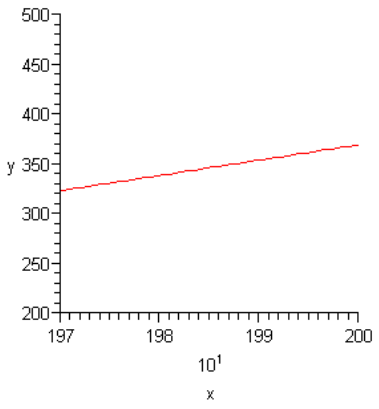
Linear Functions

Linear models are model by the equation $f(x) = mx + b$

Example 1

The average carbon dioxide level in the atmosphere, measured in parts per million at Mauna Loa Observatory from 1980 to 2002. Use the data to find a model for the carbon dioxide levels.

Year	CO_2 level
1980	338.6
1982	341.1
1984	344.4
1986	347.2
1988	351.5
1990	354.2
1992	356.4
1994	358.9
1996	362.6
1998	366.6
2000	369.4
2002	372.9



$$m = \frac{369.4 - 338.6}{2000 - 1980} = \frac{30.8}{20} = 1.54$$

$$y - y_1 = m(x - x_1)$$
$$y - 338.6 = 1.54(x - 1980)$$
$$y - 338.6 = 1.54x - 3049.2$$
$$y = 1.54x - 2710.6$$

Example 2

Some scientists believe that the average surface temperature of the world has been rising steadily. They have modeled the temperature by the linear model $T = .02t + 8.50$, where the T is temperature in ^0C and t is the years since 1900.

a) What do the slope and T-intercept represent?

The temperature rise .02 degrees Celsius each year.

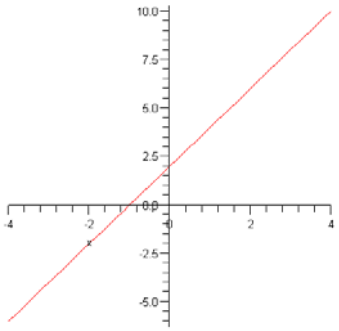
The average surface temperature in 1900 was 8.5

b) Use the equation to predict the average globe surface temperature in 2100.

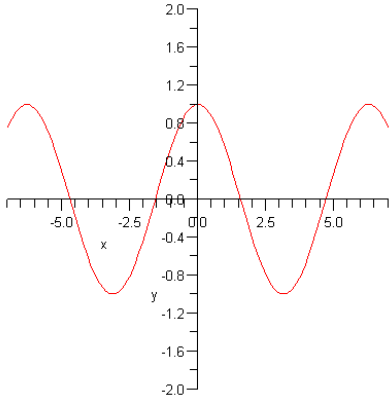
$$T = .02t + 8.50$$
$$T = .02(200) + 8.5$$
$$T = 4 + 8.5$$
$$T = 12.5$$

Type of Models

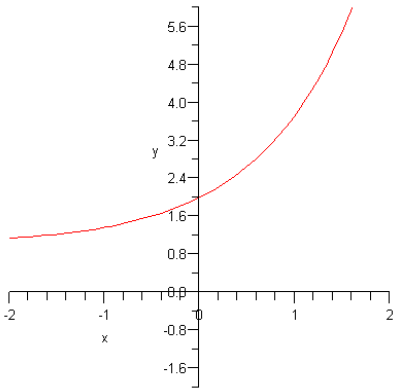
Linear Models



Trigonometric Models



Exponential models



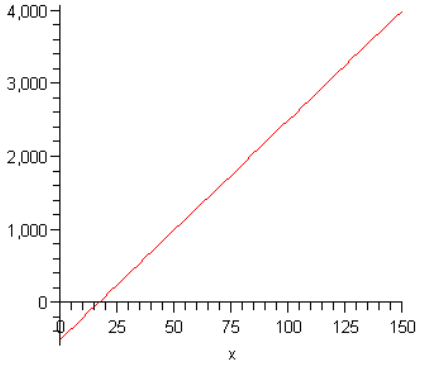
Example 4

The manager of a furniture company has found that it costs $2500 to manufacture 100 chairs in one day and $4000 to manufacture 200 chairs in one day.

a) Express the cost as a function of the number of chairs produced, assuming that it is linear. Then sketch the graph.

$$m = \frac{4000 - 2500}{150 - 100} = \frac{1500}{50} = \$30 / chair$$

$$y - 2500 = 30(x - 100)$$
$$y - 2500 = 30x - 3000$$
$$y = 30x - 500$$



b) What is the slope of the graph what does it represent?

Cost to make one chair. $m = \$15 \frac{Cost}{Chair}$

c) What is the y-intercept of the graph and what does it represent?

$b = 1000$ Starting Cost