

Chapter 4 Project ► Analyzing a Graph

Graphs of functions that are combinations of algebraic functions and trigonometric functions can be difficult to sketch by hand. For such graphs, a graphing utility is helpful.

Example ► Sketching the Graph of a Function



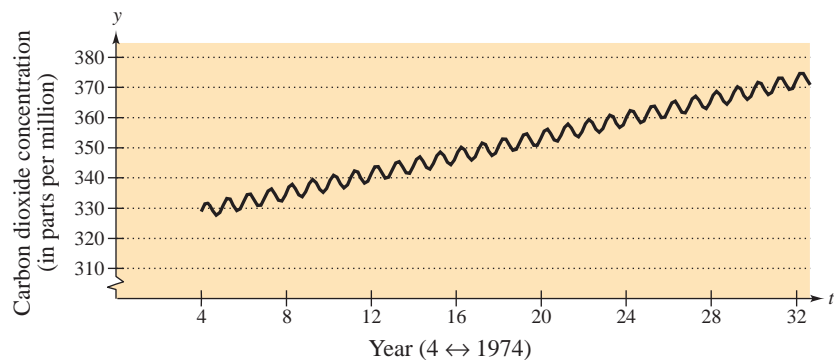
Since 1974, the Mauna Loa Climate Observatory in Hawaii has been collecting data on the carbon dioxide level of the earth's atmosphere. A model that closely represents the data is

$$y = 323 + 1.5t + 0.001t^2 + 2.5 \sin 2\pi t$$

where y represents the monthly average of carbon dioxide concentration (in parts per million) and $t = 4$ represents January 1974, $t = 5$ represents January 1975, and so on. Sketch the graph of this function and explain the oscillations in the graph. (Source: National Oceanic and Atmospheric Administration, Climate Monitoring and Diagnostic Laboratory, Carbon Cycle-Greenhouse Gases)

Solution

The graph of the function is shown below. From the graph, you can see that the carbon dioxide level fluctuates each year. The low level each year, which occurs toward the end of the summer in the northern hemisphere, is caused by the intake of carbon dioxide in growing plants.



Chapter Project Investigations

1. Sketch the graph of the model given in the example for $27 \leq t \leq 29$. Between January 1997 and January 1999, what were the highest and lowest levels of carbon dioxide? When did each occur?



In Questions 2–4, use a graphing utility to graph the function. Choose a viewing window that you think produces a good representation of the important features of the graph.

2. $y = x^2 + \sin x$

3. $y = x^2 \sin x$

4. $y = \frac{\sin x}{x}$