Section 3.2

1) Vermont Instruments makes two kinds of calculators, the VI-83 and the VI-86. The number of VI-83s sold each year is given by $d(x) = 12,376\sqrt{x}$ calculators $x$ years after 1990. The number of VI-86s sold each year is given by $i(x) = 3972x$ calculators $x$ years after 1990.

a) Write a formula for the total number of calculators sold by Vermont Instruments $x$ years after 1990.

b) Write the formula for the rate of change of the total number of calculators sold.

c) How many total calculators were sold in 2002?

d) How rapidly were calculators selling in 2002? Interpret your answer.

2) Total federal government expenditures (in billions of dollars) of the United States for the years 1991 to 1998 can be modeled by $y = 9.67x - 17,890.89$ billion dollars in year $x$.

a) Were total federal government expenditures increasing or decreasing during the time period modeled by the equation?

b) How rapidly were total federal government expenditures changing in 1997?

c) What was the average rate of change of total federal government expenditures between 1995 and 1997?

Section 3.3

1) The percentage of mothers who returned to the work force within one year after they had a child for the years 1976 through 1998 can be modeled by $P(t) = 36.025 + 6.27\ln t$ percent $t$ years after 1977. (Source: Based on data from the Associated Press)

a) What percentage of mothers returned to the work force within one year in 1998 and how rapidly was that percentage changing in 1998?

b) How rapidly on average did the percentage change from 1980 to 1990?

c) What happens to the rate at which the percentage is growing as more years go by?

Section 3.4

1) Suppose that gas costs $1.20 per gallon and that we are using gas at a rate of 3 gallons per minute. What is the rate of change of cost with respect to time, in dollars per minute?

2) A part-time office worker assembles portfolios and is paid according to the number of portfolios he assembles. Let $S(p) = 1.5p$ be his salary (in dollars) when he assembles $p$ portfolios. Let $p(t) = 5t^2$ be the number of portfolios he has assembled $t$ hours after his work day has begun. Identify the following values after he has worked two hours, and write a sentence interpreting each value.

a) $P(t)$  
b) $S(p)$  
c) $\frac{dp}{dt}$  
d) $\frac{dS}{dp}$  
e) $\frac{dS}{dt}$