Homework 2, Part 1

Section 3.2 of *Rogawski*: 5, 25, 40 (skip 21), unless you did these on Homework 1

Section 3.3 of *Rogawski*: 5, 7, 13, 15, 21, 23

Additional exercises:

Exercise 1 Find $\dfrac{d}{dx}[(1+3x-x^2)(x^2-5)]$.

Answer: $(1+3x-x^2)(2x)+(x^2-5)(3-2x)$

Exercise 2 What is $\dfrac{d}{dx}\left(\dfrac{x^2+x}{x^2-2}\right)$?

Answer: $\dfrac{-x^2-4x-2}{(x^2-2)^2}$

Exercise 3 What is $f'(10)$ if $f(x)=g(x)h(x)$, $g(10)=-4$, $h(10)=560$, $g'(10)=0$, and $h'(10)=35$?

Answer: -140

Exercise 4 Find $R'(1)$ where $R(s)=\dfrac{P(s)}{Q(s)}$, $P(1)=13$, $Q(1)=-2$, $P'(1)=7$, and $Q'(1)=-4$.

Answer: $\frac{19}{2}$

Exercise 5 At the beginning of 1991 there were 2.1 million farms in the United States with an average size of 467 acres per farm; the number of farms was decreasing 0.035 million farms per year; and the average size was increasing 7 acres per farm per year. What was the total acreage of farms and at what rate was it increasing or decreasing at the beginning of 1991?

Answer: [Total acreage] ≐ 980.7 million acres • The total acreage was decreasing 1.645 million acres per year.

Exercise 6 Figures 1 and 2 give the number $N=N(t)$ (millions) of MasterCard and Visa accounts and the total outstanding debt $D=D(t)$ (million dollars) in the U. S. as functions of the year.What were **(a)** the approximate average debt per credit card and **(b)** the rate of change with respect to time of the average debt per credit card at the beginning of 1988?

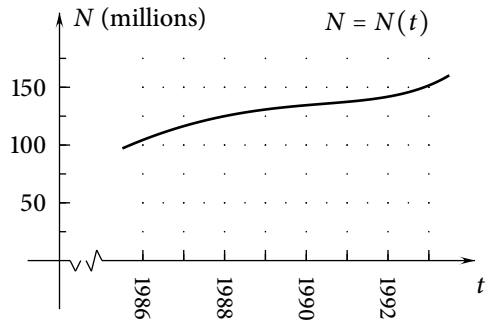

FIGURE 1

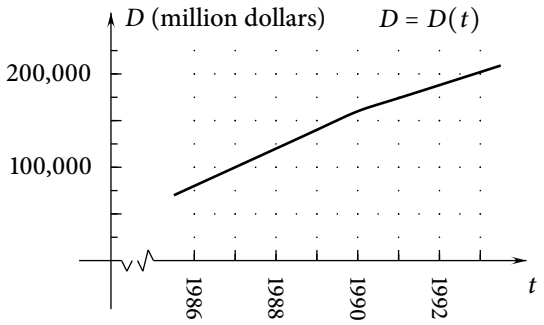

FIGURE 2

Answer: **(a)** [Average debt per card] ≈ 960 dollars per credit card **(b)** [The rate of change with respect to time of the average debt per credit card at the beginning of 1988]≈ 102.40 dollars per credit card per year

Exercise 7 Give an equation of the tangent line to $y = (1 + x - x^4)(1 - x + x^3)$ at $x = 1$. Then generate the curve and tangent line on your calculator or computer.

Answer: Tangent line : $y = 1 - (x - 1)$ • Figure A7

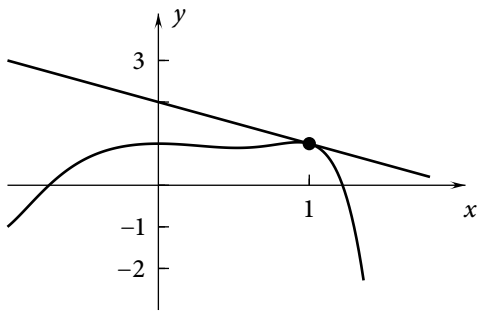

Figure A7

Exercise 8 Imagine that your investments are in the stock market, in real estate, and in livestock. Imagine that on April 15 the value of your stock-market investments is 1.2 million dollars and is rising at the rate of 0.05 million dollars per year; the value of your real estate is 2.1 million dollars and is falling 0.1 million dollars per year; and the value of your livestock is 0.5 million dollars and is rising 0.05 million dollars per year. **(a)** What is the total value of your investments on April 15? **(b)** What percent of your investments is in real estate on April 15? **(c)** At what rate is the total value of your investments increasing or decreasing on April 15? **(d)** At what rate is the percent of your investments in real estate increasing or decreasing on April 15?

Answer: **(a)** [Total value] = 1.2 + 2.1 + 0.5 = 3.8 million dollars
(b) [Percent invested in real estate] ≈ 55.26%
(c) [Rate of change of the total value] = 0 million dollars per year
(d) The percentage invested in real estate is decreasing about 2.63% per year.