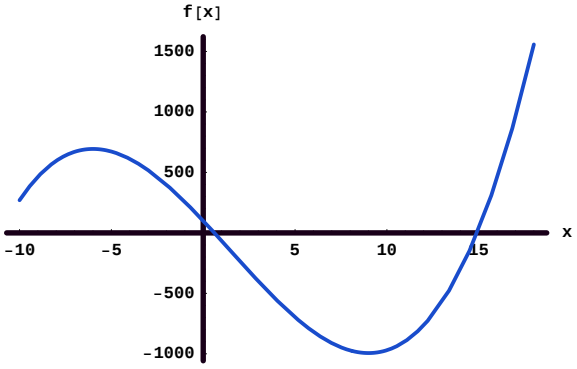
ECONOMICS 207
SPRING 2007
LABORATORY EXERCISE 9

Problem 1. For each of the following problems, find the critical points. For each critical point state whether the function is at a relative maximum, relative minimum, or otherwise. Check to see if there are potential points of inflection **at points other than** critical points.

a. $f(x) = x^3 - \frac{9}{2}x^2 - 162x + 100$

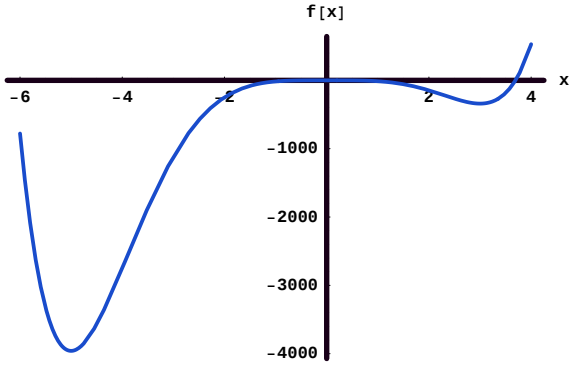
FIGURE 1. $f(x) = x^3 - \frac{9}{2}x^2 - 162x + 100$



Date: 6 March 2007.

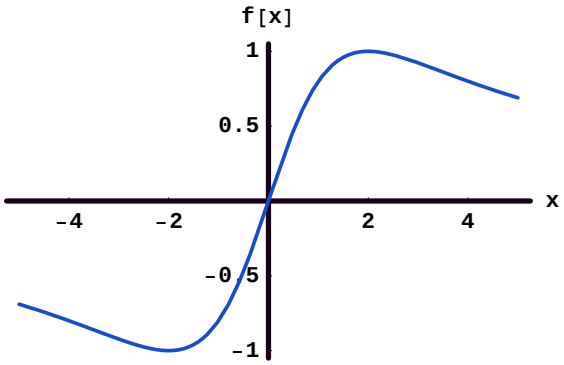
b. $y = \frac{2}{3}x^6 + \frac{8}{5}x^5 - 15x^4$

FIGURE 2. $f(x) = \frac{2}{3}x^6 + \frac{8}{5}x^5 - 15x^4$



c. $f(x) = \frac{4x}{x^2+4}$

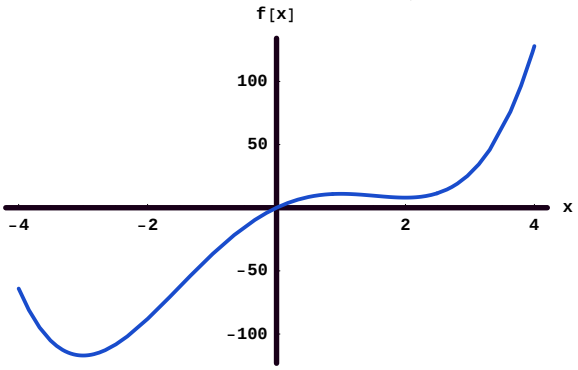
FIGURE 3. $f(x) = \frac{4x}{x^2+4}$



The points of inflection (you still need to find them) are $\frac{-4\pm\sqrt{241}}{5}$.

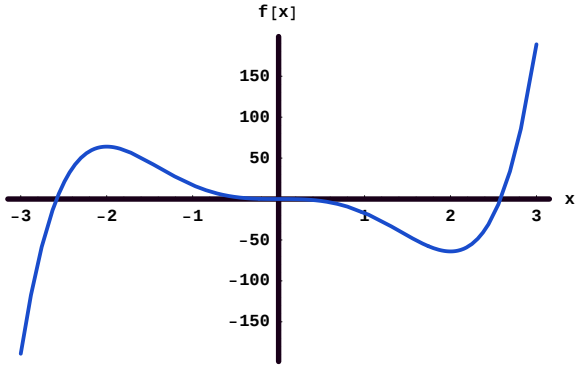
d. $f(x) = 24x - 14x^2 + x^4$, One root is x=1.

FIGURE 4. $f(x) = \frac{4x}{x^2+4}$



e. $f(x) = 3x^5 - 20x^3$

FIGURE 5. $f(x) = 3x^5 - 20x^3$



Problem 2. Consider the following matrices.

$$A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & 3 & -4 \\ 3 & -1 & 6 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & -2 & -2 \\ 3 & -5 & -5 \\ -2 & 2 & 3 \end{bmatrix}, \quad C = \begin{bmatrix} -5 & 2 & 0 \\ 1 & -1 & -1 \\ -4 & 2 & 1 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & -2 & 1 \\ -3 & 5 & -2 \\ 4 & -6 & 3 \end{bmatrix}, \quad E = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 4 & -4 \\ -4 & -5 & 3 \end{bmatrix}, \quad F = \begin{bmatrix} -8 & -13 & -12 \\ 7 & 11 & 10 \\ 1 & 1 & 1 \end{bmatrix}$$

and vectors

$$a = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \quad b = \begin{bmatrix} 2 \\ 1 \\ -3 \end{bmatrix}, \quad c = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}$$

Compute the following

a. A + B

b. AB

c. c'_B

d. a′F

e. BC

f. EF

g. Fb

h. C+E

i. C′

Problem 3. a. Use elementary row operations to solve the following system of equations. The answers are $x_1 = 8$, $x_2 = -13$, $x_3 = -6$.

$$Ax = a$$

$$\begin{pmatrix} 1 & 1 & -1 \\ 2 & 3 & -4 \\ 3 & -1 & 6 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

b. Use elementary row operations to solve the following system of equations. Use elementary row operations to solve the following system of equations. The answers are x_1 = -8, x_2 = 4, x_3 = -9.

$$Bx = b$$

$$\begin{pmatrix} 1 & -2 & -2 \\ 3 & -5 & -5 \\ -2 & 2 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$$

c. Use elementary row operations to solve the following system of equations. The answers are $x_1 = 6$, $x_2 = 16$, $x_3 = -11$. You might want to exchange the first and second rows.

$$Cx = b$$

$$\begin{pmatrix} -5 & 2 & 0 \\ 1 & -1 & -1 \\ -4 & 2 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$$