Section 4.1

1. Find the critical numbers and determine the extreme values on the interval.

(a)
$$f(x) = x^2 + x^4$$
 on [0, 1]
(b) $f(x) = \frac{x-1}{x^2+1}$ on [1, 5]
(c) $f(x) = x^2 - 8\ln(x)$ on [1, 4]

<u>Section 4.2</u>

2. Find the extrema of the function and intervals of increase and decrease.

(a)
$$f(x) = 6x^3 - 15x^2 + 12x$$
 (b) $f(x) = x^4 - 2x^3$

3. Find the points of inflection and concavity

(a)
$$f(x) = (x-1)^3(x-5)$$
 (b) $f(x) = x^4 - 18x^2 + 5$

Section 4.3

4. Graph the functions:

(a)
$$f(x) = x^4 - 2x^3$$
 (b) $f(x) = x^3 - 4x^2 + 6$ (c) $f(x) = \frac{x^2 + 1}{x^2 - 1}$

Section 4.4

- 5. The difference of two numbers is 50. Find the two numbers such that their product is a minimum.
- 6. A dairy farmer has 1400 m of fencing. He wants to create a rectangular pasture bordering a river. Find the width and length of the rectangular pasture such that the area is maximized.
- 7. A right triangle is formed in the first quadrant by the x and y axes and a line through the point (2,3). Find the vertices of the triangle such that the area is a minimum.

Section 4.5

- 8. Use linear approximation to approximate each quantity.
 - (a) $\sqrt{23}$ (b) $e^{0.01}$
- 9. Find dy for the given values of x and Δx

(a)
$$y = 2x^3 - 5x$$
, $x = -2$, $\Delta x = 0.1$ (b) $y = \sqrt{3x + 2}$, $x = 4$, $\Delta x = 0.15$