

## Homework 9 - Midterm 2 review!

due November 4, 2014

3.3.3, 7, 9, 15, 39, 40, 41

For **3.3.39-41**, (a) Find all x- and y- intercepts. (b) Find any and all asymptote. Justify your answers using limits. (c) Find the intervals where the function is increasing or decreasing. (d) Find and classify all local extrema. (e) Find the intervals where the function is concave up or concave down. (f) Find all points of inflection (if any). (g) Sketch a graph of the function, labeling all points.

3.4.15, 31, 32, 41, 49

3.5.13, 17, 18, 21, 23, 27, 29

3.6.15, 17, 19

3.7.5, 7, 9, 17, 29, 30, 33, 37, 38, 39, 41, 43

complete the following problems.

1. (a) Find the linearization of the function  $f(x) = \sqrt{x}$  at  $x = 16$ . (b) Use the linearization above to estimate the value of  $\sqrt{16.8}$ .
2. (a) Find the linearization of the function  $g(x) = \sqrt[4]{x}$  at  $x = 16$ . (b) Use the linearization above to estimate the value of  $\sqrt[4]{16.8}$ .
3. Two spherical balloons are connected so that one inflates as the other deflates, the sum of their volumes remaining constant. When the first balloon has radius 10 cm and its radius is increasing at 3 cm/sec, the second balloon has radius 20 cm. What is the rate of change of the radius of the second balloon? (The volume of a sphere of radius  $r$  is  $V = (4/3)\pi r^3$ ).
4. What is the area of the largest rectangle that can be inscribed in the region enclosed the by the semicircle  $y = \sqrt{1 - x^2}$  and the  $x$ -axis.
5. A cylindrical tank with radius 5 m is being filled at a rate of  $3\text{m}^3$  per minute. How fast is the height of the water increasing?

**Answers:**

I'll be grading 3.3.40, 3.4.32, 3.5.18, 3.7.30, and problem #5, so you'll get answers to those when you turn in the homework.

Answers to all odd-numbered textbook problems are at the back of the book.

Remaining answers:

$$3.7.38 \quad -2\sqrt{6} \text{ m}^2/\text{day} \approx 4.8990 \text{ m}^2/\text{day}.$$

1. (a)  $L(x) = 4 + (x - 16)/8 = 2 + x/8$ . (b)  $\sqrt{16.8} = f(16.8) \approx L(16.8) = 2 + 16.8/8 = 4.1$ . Thus  $\sqrt{16.8} \approx 4.1$ .

2. (a)  $L(x) = 2 + (x - 16)/32 = 3/2 + x/32$ . (b)  $\sqrt[4]{16.8} = f(16.8) \approx L(16.8) = 3/2 + 16.8/32 = 2.025$ . Thus  $\sqrt[4]{16.8} \approx 2.025$ .

3.  $-0.75 \text{ cm/sec}$ .

4. 1.