Math 135, Sections 16-18
Review problems for Exam #2 - March 30, 2010

This is the complete list of review problems.

Review sessions will be held on:
Wednesday, March 31, 7:00 - 9:00 PM in SEC-117 (BUSCH)
and
Saturday, April 3, 2:00 - 4:00 PM in HILL-116 (BUSCH)

#1 Find $\frac{dy}{dx}$ and if $2x + e^{xy} = 0$.

#2 Find an equation of the tangent line to the graph of $x^2y - 2xy^3 = 0$ at the point $(2, 1)$.

#3 Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at the point $(2, 1)$ on the graph of $(x - y)^3 + y^2 = 2$.

#4 Find the derivative of the function $(2x + 1)^{(3x+1)}$ (where $x > 0$).

$5 If $y = 2\sqrt{x} - 9$ and $\frac{dy}{dt} = 5$ find $\frac{dx}{dt}$ when $x = 9$.

#6 One end of a rope is fastened to a boat and the other end is wound arond a windlass located on a dock at a point 5 feet above the level of the boat. If the boat is drifting away from the dock at the rate of 7 feet/minute, how fast is the rope unwinding at the instant when the lenght of the rope is 13 feet?

#7 A car travels north from the city of Centralia at the rate of 30 miles per hour, starting at 11 AM. A truck travels east from Centralia at the rate of 45 miles per hour, starting at noon. How fast is the distance between the truck and the car changing at 1 PM?

#8 Find $d(x\sqrt{x^2 - 1})$.

#9 Use differentials to approximate $\sqrt{9.04}$.

#10 The radius of a circle has been measured as 15 inches, but there is a possible error of 0.05 inch in the measurement. Give an approximate value for the error in the computed area.

#11 For each of the following functions:
(i) find all critical numbers;
(ii) find the intervals where the function is increasing;
(iii) find the intervals where the function is decreasing;

(iv) determine whether each critical point is a relative maximum, a relative minimum, or neither;

(v) find the intervals where the graph of the function is concave up and the intervals where the graph of the function is concave down;

(vi) find all points of inflection;

(vii) find all horizontal and vertical asymtotes (realizing that there may be none);

(viii) sketch the graph of the function.

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

#12 Sketch the graph of a function satisfying the following conditions:
$lim_{x\to-\infty} f(x) = 1$,
$lim_{x\to\infty} f(x) = -1$,
$lim_{x\to1^-} f(x) = -\infty$,
$lim_{x\to1^+} f(x) = \infty$,
$f'(x) > 0 \ \ if \ \ x < -1, \ \ or \ \ if \ \ 3 < x$,
$f'(x) < 0 \ \ if \ \ -1 < x < 1, \ \ or \ \ if \ \ 1 < x < 3$,
$f''(x) > 0 \ \ if \ \ x < -3 \ \ or \ \ if \ \ 1 < x < 4$,
$f''(x) < 0 \ \ if \ \ -3 < x < 1 \ \ or \ \ if \ \ 4 < x$.

#13 Find the absolute maximum and minimum values of the following functions on the given intervals. Give the values of x for which the absolute maximum and absolute minimum are attained.
(a) $f(x) = x^2 - 6x + 1, \ \ on \ \ [1, 4]$,
(b) $f(x) = \frac{x^3}{3} - x^2 + 1 \ \ on \ \ [-3, 3]$,
(c) $f(x) = |2x - 1| \ \ on \ \ [0, 2\pi]$.
(d) $f(x) = sin^2(x) + cos(x) \ \ on \ \ [0, 2]$.

#14 Find the value of each of the following limits:

(a) $lim_{x\to0} \frac{\sqrt{1+x}-1}{x}$,

(b) $lim_{x\to0} \frac{x-sin(x)}{x^3}$,

(c) $lim_{x\to0} x^{-5} ln(x)$,

(d) $lim_{x\to\infty} \frac{ln(ln(x))}{x}$,

(e) $lim_{x\to0} (\frac{1}{sin(3x)} - \frac{1}{3x})$,

(f) $lim_{x\to0^+} (\frac{2cos(x)}{sin(2x)} - \frac{1}{x})$.