MAT 161 Final Exam Name

Wednesday, May 2, 2012

1. Calculate the following limits:
   1.  b. 
2. Use the definition of the derivative to find *f′(x)* when *f(x)* = 7*x*2 +5*x+3*.
3. Give a delta-epsilon argument that 
4. Tell why f(x) = (x2)1/2 is not differentiable at *x* = 0 but is continuous there.
5. Calculate for the following:
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
6. Use a linear approximation to estimate 
7. Find the equation of the tangent line to the curve  at (1,-2).
8. Water is pumped at the rate of .01 cubic yard per minute from a sphere of radius 3 yards. How fast is the height of the water falling in the sphere when the height is 2 yards?

[For extra credit: consider a cone of radius r and height h as a volume of revolution. Derive the formula for the volume of the cone.]

[For additional extra credit: Suppose the bottom half of a sphere of radius 20 feet is filled with a fluid weighing 60 lbs per cubic foot. How much work is done in empting the sphere by pumping the fluid to a valve at the top of the sphere.]

1. What are the dimensions of a cylinder of minimum surface area if the volume is to be 20 cubic meters?
2. Calculate
   1. * b. *

1. For 
   1. Calculate the first and second derivative of *f(x).*

* 1. Find the intervals where *f(x)* is increasing and decreasing. Hint: (x-4)(x-7) should appear as part of your work.

* 1. Find the intervals where *f(x)* is concave up and concave down. Hint: (x-6)(5x-14) should appear as part of your work.

* 1. Identify the local maximum, local minimum, and inflection points.

* 1. Find the *x*- and *y*-intercepts of *y = f(x).*

* 1. Sketch the graph of *y = f(x).*

1. The side of cube is estimated to be 10 +- .02 cm. Estimate the volume and the measurement error for the volume. 

1. Find the area from *x* = 0 to *x* = 5 between the *x*-axis and the curve *y* = 6*x* + 8x.

1. Evaluate the Riemann Sum for *f(x)* = 10*x* +2, 4 ≤ *x* ≤ 7, with six subintervals, taking the sample points to be midpoints.
2. Find *f(x)* if *f′′(x)* = 6*x*2 – *x* and *f*(1) = 10 and *f′* (1) = 2.

1. Find the average value of *f(x)* = *x*3 on [1,4].

1. *a.* Calculate the area between the curves *y* = x2 and *y* = 3*x* -2.

* 1. Rotate the area in (*a*) about the *y*-axis and give the integral that determines the value. Do not evaluate the integral.

* 1. Rotate the area in (*a*) about the *x*-axis and give the integral that determines the value. Do not evaluate the integral.