This file includes extra homework problems to be written out neatly and handed in:

**Section 2.1**

1. Find the average rate of change of the function on the following intervals
   1. [0, ]
   2. [0, ]
   3. [0, ]

**Section 2.2**

1. 
2. 

**Section 2.4**

1. 
2. 
3. 

**Section 2.5**

1. At what values of is the function not continuous? Give the type of discontinuity and if the discontinuity is removable, define the function at the relevant point to make it continuous there.
   1. 
   2. 
   3. 
2. For what values of and is the function  continuous for all 

**Section 2.6**

1. 
2. Sketch 
3. 

**Section 3.1**

1. Find the slope of the curveat .

**Section 3.2**

1. Find the equation of the tangent line and the line normal to the curve.
2. If is differentiable at and the derivative is 6, is differentiable at and, if so, what is its derivative there? Show why.

**Section 3.3**

1. Find the first and second derivatives of  (example 6 may be useful)
2. Find the limits by noting that they are really derivatives:
   1. 
   2. 
3. What value(s) of   and make  differentiable for all ?

**Section 3.4** No hand-in homework

**Section 3.5**

1. Find the derivative of and of .
2. Is there a value of that will make  continuous at? Is there a value of that will make  differentiable at ? Explain.

**Section 3.6**

1. Find the derivatives of  and from the results, find a function of the form whose derivative is.

Similarly, find a function of the form whose derivative is .

**Section 3.7**

1. Find for 
2. Show that the curves and meet at right angles. (First find where they intersect, then show that their slopes at these points are negative reciprocals).

**Section 3.8**

1. Find the derivative of 
2. Find the derivative of 
3. Show that is a solution of the equation: 

**Section 3.9**

1. Find and compare the derivatives of:
   1.  b.  and c. (simplify)
2. Find and compare the derivatives of:
   1.  b.  and c. 
3. Compare the derivatives of. What does this mean?

**Section 3.10**

1. Water is flowing at the rate of 50 m3/min from a conical concrete reservoir (vertex down) of base radius 45m and height 6m. How fast is the water level falling when the water is 5m deep? How fast is the radius of the water’s surface changing at that instant?

**Section 3.11**

1. Find the linearization of  at  . How is it related to the individual linearizations of  and  at?

**Section 4.1**

1. Find the absolute maximum and minimum of on [-2,3].
2. Find the absolute maximum and minimum of on [-1,2].
3. Find the absolute maximum and minimum of  on .

**Section 4.2**

1. Verify that satisfies the hypotheses of Rolle’s Theorem on [0,2]. Then find all numbers, , that satisfy the conclusions of Rolle’s Theorem.
2. Verify that satisfies the hypotheses of the Mean Value Theorem on [0,2]. Then find all numbers, , that satisfy the conclusions of the Mean Value Theorem.
3. Show that for  there is no number that satisfies the conclusion of the Mean Value Theorem for the interval [0, 2]. Explain why.

**Section 4.3**

1. For the following functions, find the intervals on which they are increasing and decreasing and find the local minimum and maximum values
   1. 
   2. 
   3.  on 

**Section 4.4**

1. Sketch the following graphs by finding, critical points, extrema, intervals of increase and decrease, intervals where the function is concave up and where it is concave down, all asymptotes.
   1. 
   2. 
   3.  on 
   4. 

**Section 4.5**

1. Find the following limits:
   1.  b.  c. 

**Section 4.6**

1. Find a positive number for which the sum of its reciprocal and 27 times its cube is the smallest possible.
2. Find the point on the line  that is closest to the origin.
3. What value of  makes have a critical point at ?
4. What value of  makes have a point of inflection at ?

**Section 4.7**

1. Use Newton’s Method to find the value(s) of  for which
   1.  b.  c. 

**Section 4.8**

1. Evaluate: 
2. Evaluate: 
3. Solve the initial value problem:  where .

**Section 5.1**

1. Estimate the area beneath the curve  on [2,8] using 4 equal length intervals and using
   1. Left endpoints b. Right endpoints c. Midpoints

What do each of these yield as estimated average value of the function over the interval?

**Section 5.2**

1. For the following functions and the given intervals: Divide the interval into subintervals of equal length, find the length of each subinterval, denote the left and right endpoints of each subinterval in terms of , set up a Riemann sum for the area beneath the curve using the right side endpoint, take the limit of the Riemann sum as .
   1.  on [0,3]
   2.  on [0,1]
   3.  on [2,5]

**Section 5.3**

1. , find 
2. Use the relevant formulas from your text to evaluate 
3. Use area to calculate  and 

**Section 5.4**

1. Find the linearization at for 
2. Find 
3. Find 

**Section 5.5**

1. Integrate
   1.  b.  c. 

d. 

**Section 5.5**

1. Integrate 
   1. using the substitution 
   2. using the substitution 
   3. noting that  and using 
   4. Explain how these solutions can all be the same.

**Section 5.6**

1. Evaluate
   1.  and b. 
2. Find the area of the region enclosed by the -axis and the curves.