Midterm II: Some problems for review

The exam will be taken in class (SCB 211) on Friday 3/20. You will do the exam on paper. You can use a pocket calculator of any kind. Phones, laptops, and notecards are not allowed. The instructor will provide scratched papers for you.

Other exam policies:

The proctor may reassign your seat at the beginning or at any time during the exam.

Using a phone or any unauthorized assistance while the exam is in progress, whether inside or outside of the classroom, is prohibited.

If you need to leave the room for any reason, you must first obtain the proctor's permission. If the proctor is not present in the room and you want to leave, you must wait until he/she comes back.

Violation of any of the above policies is considered as cheating and may result in a score of zero.

The textbook sections to be covered are 2.1, 2.2, 2.4, 2.5, 7.1, 7.2. You should review the homework problems, worksheets, quizzes, examples given in the lectures. It is always a good idea to study for the exam with someone.

Some problems to practice:

1) Express the following functions as a power series.

(a) $f(x) = \frac{1}{2+x}$ about $x_0 = 0$.

(b) $f(x) = \frac{5}{2+3x^2}$ about $x_0 = 0$.

(c) $f(x) = \frac{1}{1-x}$ about $x_0 = 3$.

(d) $f(x) = x^3 + x - 3$ about $x_0 = 1$.

2) Find the interval of convergence of the power series $\sum_{n=1}^{\infty} \frac{n}{n+1} x^n$.

3) Consider a mass spring system. Suppose that spring stretches 2 cm when an object of 0.1 kg is hung at one end. The coefficient of friction is $c = 0.01$ kg/s. Suppose the object is initially at the equilibrium position and has an initial velocity of 3 cm/s (downward). What is the position of the object at time $t = 3$ second?

4) Solve the initial value problem $y' + xy = x^2$, $y(0) = 0$ using power series method.

5) Find the general solution to the differential equation $y'' + y = x$ using

(a) Undetermined Constants method

(b) Variation of Parameters method