Test 3 Review, Math 1410

Spring 2014, Dr. Graham-Squire

•The test will cover sections 3.9, 4.1-4.3, 4.5, 4.6, and 4.8.

•To study, you should read over your notes, try to re-work old HW and quiz problems, and work on practice problems out of the textbook. You can look at the questions at the end of Chapters 3 and 4, and you can also try to work the recommended practice problems listed on each section of class notes. You can also use the Test material on my website, but not all of the questions match. From Spring 2013:
– Test #3: All questions *except for* question 7. –Test #4: Question number 4.

The questions from Fall 2011 tests that best match this test are:
–Test 2: Question 8. –Test 3: Everything *except for* questions 7a and 10.

•It can be helpful to rewatch the video lectures, and/or look at a copy of the blank notes and try to work the examples and exercises. I also post the old Written Assignments, as well as some that we did not get to in class (but would be good for practice).

•A calculator might be useful for certain questions, but you will still need to show your work to get full credit. There will be at least one question where you cannot use a calculator.

•Below are some problems to work on to practice for the test. Be forewarned, though, that THE QUESTIONS ON THE TEST WILL NOT NECESSARILY BE THE SAME AS THE ONES BELOW! There are a variety of questions that I can ask, and the ones below are just a sample. If you just work the problems below, that does <u>not</u> mean that you are completely prepared for the test. If you get stuck on any of the problems below, that probably indicates an area where you should study some more.

1. Let $f(x) = \ln(2 - x)$.
   (a) Use either differentials or linearization to approximate $\ln(1.7)$.
   (c) Calculate $\ln(1.7)$ on your calculator. How close is your approximation?
2. Dominic has attached his baby sister Eva to a kite and is letting the baby drift away in the wind. Assuming that the kite stays at a constant height of 100 feet above the ground and kite string is coming out of the spool at a constant rate of $5\sqrt{3}$ feet/minute, find the rate at which the angle of elevation (that is, the angle between the kite string and the ground) is changing when the kite string is 200 feet long.
3. Find the absolute maximum and absolute minimum of the function $f(x) = \frac{2}{3}x^3 - \frac{3}{2}x^2 - 9x + 2$ on the interval [-2, 5].

4. Sketch the graph of $f(x)$ given that:
   - $f(0) = 3$ and $f(1) = 0$
   - $x = 2$ is a vertical asymptote.
   - $f'(x) > 0$ on $(-\infty, -1)$, $(2, 5)$ and $(5, \infty)$
   - $f'(x) < 0$ on $(-1, 2)$.
   - $f''(x) > 0$ on $(-\infty, -2)$ and $(5, \infty)$
   - $f''(x) < 0$ on (-2, 2) and (2, 5)
   - $\lim_{x\to\infty} f(x) = \infty$ and $\lim_{x\to(-\infty)} f(x) = 1$

5. Find all local maximums, minimums, and intervals of decrease or increase for the function $f(x) = \dfrac{x^2 - 1}{x^3}$.

6. Calculate (a) $\lim_{x\to\pi^+} \dfrac{x - \pi}{\cos x}$

   (b) $\lim_{x\to\infty} \ln(x^4 + 3) \cdot x^{-2}$

7. A farmer wants to use fencing to construct a rectangular pen and subdivide it into six equal rectangles. Thus the fencing will be used for both the perimeter of the pen and the pieces that go across the inside to form the subdivisions. The farmer has exactly 408 meters of fencing. Find the outer dimensions of the pen he can build with the maximum possible area. Use calculus to explain how you know that your answer is a maximum.

8. Find the most general antiderivative of $f'(x) = x(x + 2)^2 - \csc^2 x$.