General Instructions

1. **Write in complete mathematical sentences.** I am requiring this for two reasons. The first one is I want to know if you know why you are doing what you are doing and not just copying the "template" used in class. Note that writing in complete mathematical sentences does not mean that you write everything in words. Just write whatever you think will prove that you know what you are doing.

2. **You are only required to answer three items.** Let $wxyz - abcde$ be your student number. If d is odd, I will check only #1 and #3. If d is even, I will check only #2 and #4. I highly recommend you do ALL the exercises, though. No bonus will be given for answering items not assigned to you (except for the bonus knowledge you earn, which is also important).

3. **Each item must be alloted at least one page.** Do not start answering an item in the middle of a page. Go to the next page. Or better, go to the next spread. The bluebook has many pages. No need to cram everything in a few pages.

4. **Do not hesitate to consult if you need help.** This is a 2% of your final grade and you have more control to do better here than on the exams. If you have already given enough effort on a problem and you are still confused, feel free to schedule a consultation with your instructor.

5. **Submit your homework on or before April 26, 2013 at 5:00pm. Late homeworks will not be accepted.** Leave it on my shelf on MBAN 218. Be sure your homework is written on the bluebook I required you to have during the start of the semester.

1. Find the first eight derivatives of $f(x) = x \sin x$. Use the pattern to obtain the 2013^{st} derivative of $f(x)$.

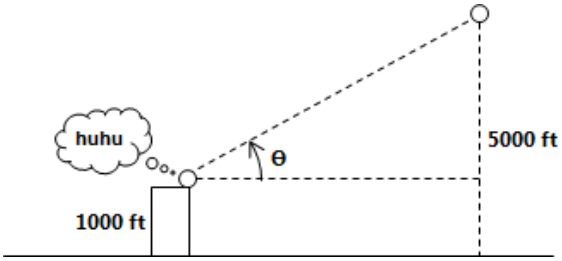
2. Use implicit differentiation to find $\dfrac{dy}{dx}$ of

$$y^2 + 2xy = \cos(x^3 - y).$$

3. Determine whether the function

$$g(x) = \begin{cases} \pi + x & , x < -\pi \\ \sin x & , -\pi \leq x \leq 0 \\ x^2 + x & , 0 < x < 1 \\ \sqrt{x^4 + 1} & , x \geq 1 \end{cases}$$

is differentiable at the points $x = -\pi$, $x = 0$ and $x = 1$.

4. 

Superman is flying horizontally at a constant height of 5000 ft above the ground. Batman, depressed that he is unable to fly, observes atop a 1000-foot building as he weeps of envy, as shown in the figure. Meanwhile, Superman is also depressed that his speed is just 400 feet per hour. At a certain instant, the angle of elevation, θ, is $\dfrac{\pi}{6}$ radians and is decreasing. How fast is the angle of elevation (of Superman from Batman) decreasing at this instant?