**Math 121 Test 2**

**October 16, 2012**

Name_____________________________

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**Directions:**

1. No books, notes or high altitude parachuting. You may use a calculator to do routine arithmetic computations. You may *not* use your calculator to store notes or formulas. You may not share a calculator with anyone.

2. You should show your work, and explain how you arrived at your answers. A correct answer with no work shown (except on problems which are completely trivial) will receive no credit. If you are not sure whether you have written enough, please ask.

3. You may not make more than one attempt at a problem. If you make several attempts, you must indicate which one you want counted, or you will be penalized.

4. You may leave as soon as you are finished, but once you leave the exam, you may not make any changes to your exam.

5. This test has 6 problems.
1. (15 points) Given \( f(2) = 1, f'(2) = 7, f(8) = 5 \) and \( f'(8) = -3 \) find:

   (a) \( g'(2) \) if \( g(x) = x^2 + 3f(x) \)

   (b) \( g'(2) \) if \( g(x) = (x^2 + 3)f(x) \)

   (c) \( g'(2) \) if \( g(x) = \frac{x^3 + 3}{f(x)} \)
2. (20 points) Given \( f(2) = 1, f'(2) = 7, f(8) = 5 \) and \( f'(8) = -3 \) find:

(a) \( g'(2) \) if \( g(x) = f(x^3) \)

(b) \( g'(2) \) if \( g(x) = (f(x))^3 \)

(c) \( g'(5) \) if \( g(x) \) is the inverse of \( f(x) \)

(d) \( \lim_{x \to 0} \frac{f(2 + x) - f(2)}{x} \)
3. (15 points) Find $\frac{dy}{dx}$ for:

(a) $y = \sin^2(x^2)$

(b) $y = x^3e^{2x} + \tan(2x)$

(c) $y = \ln \sqrt{\frac{x-1}{x+1}}$
4. (15 points) Find \( f'(x) \) for:

(a) \( f(x) = x^\pi + \pi^x + x^\pi + \pi^x \)

(b) \( f(x) = \arctan(\sec x) \)

(c) \( f(x) = \sinh(\cosh(x^2)) \)
5. (20 points)

(a) Find the values of $x$ for all the points on the graph of $y = 1 - x^2$ where the tangent line passes through the point (2, 0).

(b) Find an equation of the line tangent to the graph of $12(x^2 + y^2) = 25xy$ at the point (3, 4).
6. (15 points) Prof. Kenny and President Snyder elope in a hot air balloon, which rises at a constant rate of 3 meters per second. Five seconds after they cast off, President Snyder’s jilted suitor Bonzo McTavish races up in his Porsche. He parks 50 meters from the launch pad, and runs toward the pad at 2 meters per second. At what rate is the distance between Bonzo and the balloon changing 5 seconds later, when the balloon is 30 meters above the ground?