Math 201 GH — **EXAM #1** — March 19, 2014

Please PRINT your name on the cover of your exam booklet. Write clearly and cross-out work not to be graded. ALL ANSWERS GO IN THE EXAM BOOK.
NO calculators or other electronic devices, or scrap paper allowed. SHOW ALL WORK.
Total: 100 pts.

1. (a) Find the derivative y' and simplify: (15 pts.)
   (i) $y = \sqrt{x}(x^3 + 1)^{16}$ (ii) $y = \frac{2x^2-1}{3x+5}$ (iii) $y = \sin(\cos(x^2))$

   (b) Assume y is a differentiable function of x given by $x^3 y + y^3 x = 30$. Find its   (10 pts.)
   derivative y'.

2. Use the **definition** of derivative, NOT the rules of differentiation, to find the derivative   (10 pts.)
   $f'(x)$ if

   $$f(x) = \frac{2}{x+1}$$

   .

3. Use linear approximation (or differentials) to estimate $\sqrt{24.9}$ (15 pts.)

4. Find the following limits, or state that they do not exist (dne):   (10 pts.)

   (a)

   $$\lim_{x \to \infty} \frac{1 - x^2}{x^3 - x + 1}$$

   (b)

   $$\lim_{x \to 0^+} \frac{1}{\sqrt{x}}$$

5. An object thrown directly upward from ground level with an initial velocity of 48 feet   (15 pts.)
   per second is approximately $s(t) = 48t - 16t^2$ feet high at the end of t seconds.

   (a) Find its velocity $v(t)$ and its acceleration $a(t)$.

   (b) What is the maximum height attained?

   (c) How fast is it moving, and in which direction, at the end of 1 second?

6. A balloon is rising vertically at a rate of $2 ft/s$. An observer is located $300 ft$ from a   (25 pts.)
   point on the ground directly below the balloon. At what rate is the distance between
   the balloon and the observer changing when the height of the balloon is $400 ft$?