Name _____ Signature _____

Math 220   –   Exam 2 (A)   –   March 13, 2014

1. (10 points) Find $\displaystyle\lim_{x\to-\infty} \frac{\sqrt{16x^2 + 3x + 2}}{5x + 9}$.

2. (10 points) Let $g(x) = x^2 + 8$. Using the **limit definition of the derivative**, find $g'(3)$.

3. (6 points) Suppose that a waiter brings you a cup of hot coffee. Let $F(t)$ denote the temperature in degrees Fahrenheit of the coffee after t minutes. Is $F'(3)$ positive or negative? Explain your answer.

4. (9 points) Suppose that the position of a particle is given by $s(t) = t^2 + 4$ meters at time t seconds. Find the instantaneous velocity at time $t = 3$ seconds.

5. (10 points) Find the tangent line to $y = x^2 + 3$ at $x = 2$.

6. (10 points) Let $g(x) = x^x$. Find $g'(x)$.

7. (10 points) Find $\frac{dy}{dx}$ for $x^2 + 4y^2 = 3$.

8. (7 points each) Find the following derivatives. You do not need to simplify.

A. $\dfrac{d}{dx}\left(\arctan(x) + \sqrt{x}\right)$

B. $\dfrac{d}{dx}\left(e^{5x^3 + 2x}\right)$

C. $\dfrac{d}{dx}\left(\dfrac{3x^2 + 2}{x^8 + x^4}\right)$

D. $\dfrac{d}{dx}\left(3^x \cdot \cos(x)\right)$

E. $\dfrac{d}{dx}\left(\ln(\sin(x^2 + 1))\right)$