MAT 161—Exam #2A—10/21/14

Name: _____

Calculators are NOT allowed. Show all work using correct mathematical notation. Unless otherwise indicated, you may use appropriate short-cut rules for computing derivatives.

1. (15 points) Find the derivative of each of the following functions, and simplify your answers as much as possible.

    (a) $f(x) = \dfrac{4}{x^3}$

    (b) $g(x) = x^2 \ln x$

    (c) $h(x) = \sin(2x) + \pi^4$

2. (10 points) Find the equation of the tangent line to the curve $y = \sqrt{x}$ at $x = 9$.

3. (15 points) Let $f(x) = x^2 + 3x$. State the definition of the derivative in terms of a limit, and use it to calculate $f'(x)$. No credit will be given for short-cut methods.

4. (10 points) A particle's position (in meters) after t seconds is given by $s(t) = 4\cos(\pi t)$.

   (a) Find the particle's velocity function.

   (b) Find the particle's acceleration (the rate of change of velocity) at $t = 2$.

5. (25 points) Find $\dfrac{dy}{dx}$ for each function below. You do not need to simplify your answers, but you must include all necessary parentheses!

(a) $y = e^x \sec x$

(b) $y = \dfrac{\sin^{-1} x}{x^3 + 7}$

(c) $y = x^2 \, 7^{\tan x}$

(d) $y = \sin^9(e^{5x})$

(e) $y = (\ln(\ln x))^4$

6. (12 points) Find $\dfrac{dy}{dx}$ for the curve $xy^3 + 5\sin y = 12$.

7. (13 points) The bottom of a 10-foot ladder slides away from a wall at a rate of 3 ft/sec. How fast is the top of the ladder sliding down the wall when it is 6 feet above the floor?