

**Math 111 – Spring 2014**  
**Examination 2**

Please complete the following problems. All work must be shown in order to receive full credit. Answers without explanation will receive *no* credit. The use of books, notes, calculators, or any other external sources of information is not allowed during this examination.

1.(15 pts.) Find  $y'(x)$  for the following:

a.  $y = \sqrt{x^2 + \sec^2(x)}$

b.  $y = \log_5(\csc(x))$

c.  $y = \tan^2(\sin(3x))$

2.(15 pts.) Find  $y'(x)$  for the following:

a.  $y = 10^{x+\cos(x)}$

b.  $y = \sqrt{x} \arcsin(\sqrt{x})$

c.  $y = \frac{\ln(x)}{x^e + e^e}$

3.(10 pts.) Find  $y'(x)$  for the following:

a.  $y = (\sqrt{x})^x$

b.  $y = xy^2 + e^{3xy}$

4.(10 pts.) Find  $y'(x)$  for the following:

a.  $y = \ln\left(\frac{\sqrt{x^4 + 1}}{x^3}\right)$

b.  $y = (x \sin(x^2))^{\frac{3}{2}}$

5.(10 pts.) Find  $\frac{d^{111}y}{dx^{111}}$  for  $y = xe^x$ .

6.(18 pts.) This question is about tangents and normals to curves.

a. Find the tangent line to  $y = 6x^{\frac{2}{3}} + \frac{8}{x}$  at  $x = 8$ .

b. Find the normal line to  $y = \frac{1}{\arctan(x)}$  at  $x = 1$ .

7.(12 pts.) A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/sec, how fast is the angle between the ladder and the ground changing when the bottom of the ladder is 6 ft from the wall?

8.(10 pts.) Use the definition of the derivative as the limit of a difference quotient to find the derivative of  $f(x) = \frac{1}{\sqrt{x}}$ .