# Math 111 Exam #2

## October 26, 2016

**Time:** 1 hour and 25 minutes
**Instructions:** Show all work for full credit. No outside materials or calculators allowed.
**Extra Space:** Use the backs of each sheet for extra space. Clearly label when doing so.

**Name**: ______________________________

**ID #**: ______________________________

**Instructor/Section:** ___________________

*"I pledge by my honor that I have abided by the NJIT Academic Integrity Code."*

__________________________ (Signature)

| Problem(s) | Score | Total |
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1. Find the derivatives, dy/dx, of the following functions **(10 points)**:
   a. $y = x\ln(x^2)$
   b. y = sec(x)tan(x)

2. Find the derivatives, dy/dx, of the following functions. Fully rationalize and simply answers to a single fraction. It *may* be helpful to simply *first*. **(10 points)**

   a. $y = \dfrac{\sqrt[3]{x^5}}{(4x^3)^{-1/2}\,2x^2}$

   b. $y = \dfrac{x+e}{\sqrt{x^2+e^2}}$

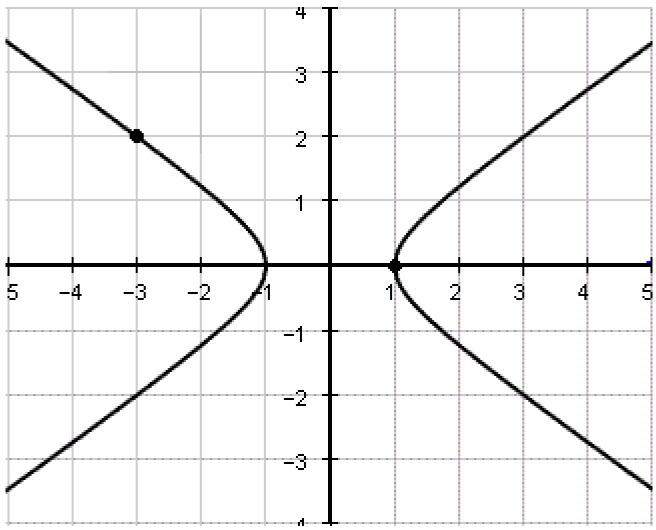
3. Find the derivatives, dy/dx, of the following functions and simplify **(18 points)**:

a. $y = \arcsin(\sqrt{3x})$

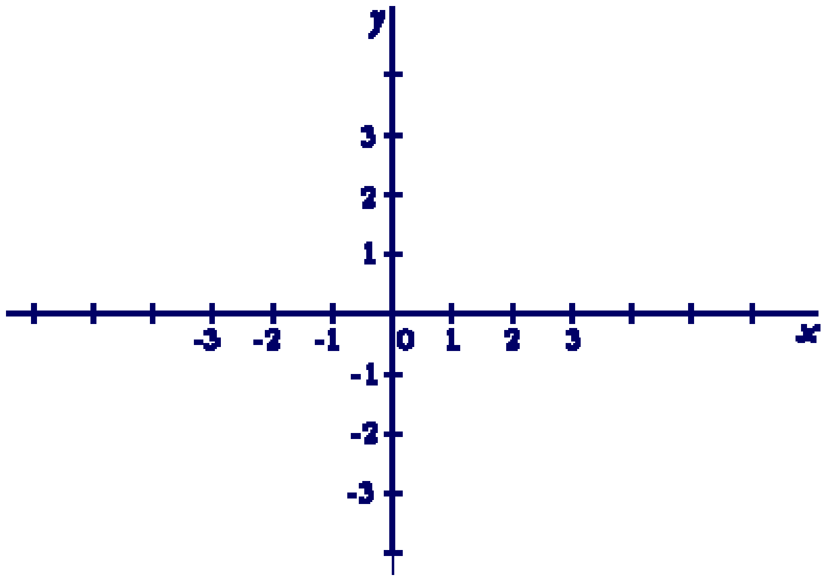
b. $y = \dfrac{1}{[(\sin kx)(\cos kx)]^2}$ where k is an unknown constant

b. $y = [\sin(3x)]^x$ for $0 < x < \pi/2$

4. The picture below shows the graph of the hyperbola $x^2 - 2y^2 = 1$. Find the coordinates of the point(s) on the curve where the slope is 1. **(12 points)**



5. Given the function $f(x) = e^{-x}$, find the equation of the tangent line to the curve at the point where $x = 1$. Graph the original function and the tangent line together below. Label x and y intercepts with their coordinates. **(11 points)**

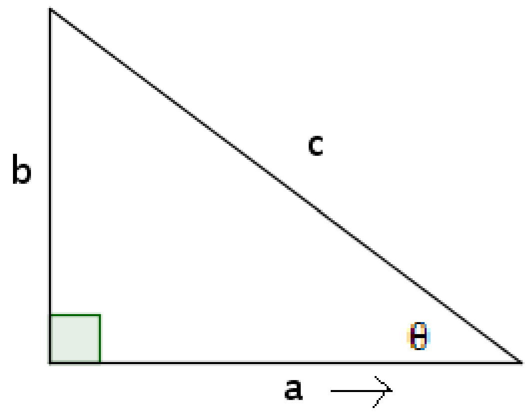



6. Consider the function $f(x)=x^2 - 4ax + 3a^2$ (where 'a' is an unknown constant). Find the (x,y) coordinates on f(x) where the slope is zero. Answer will be in terms of 'a'. **(3 points)**

7. Find the equation of the tangent line to the curve $y = \sqrt[3]{x^5}$ at the point on the curve were x=8. Place your answer in y=mx+b form. **(10 points)**

8. A circle is slowly increasing in size. At the moment when its radius has increased to 5 cm, its area is increasing at a rate of 10 $cm^2$/min. At this moment, how fast is its circumference increasing? **(10 points)**

9. Given the right triangle pictured to the right. Suppose that a=5 feet and c=13 feet. Suppose side ‘a’ begins stretching to the right at a rate of 3 ft/min. As this happens, side ‘b’ remains constant and side ‘c’ stretches with it. Find the rate at which the measure of angle θ is changing at the moment when side ‘a’ has stretched to 12 feet in length. **(10 points)**




10. Find $\frac{d^{100}y}{dx^{100}}$ if $y = 2xe^x$ **(6 points)**