

NAME: \_\_\_\_\_

Panther ID: \_\_\_\_\_

Exam 2 - MAC 2311

Spring 2015

**Important Rules:**

1. Unless otherwise mentioned, to receive full credit you **MUST SHOW ALL YOUR WORK**. Answers which are not supported by work might receive no credit.
2. Please turn your cell phone off at the beginning of the exam and place it in your bag, **NOT** in your pocket.
3. No electronic devices (cell phones, calculators of any kind, etc.) should be used at any time during the examination. Notes, texts or formula sheets should **NOT** be used either. Concentrate on your own exam. Do not look at your neighbor's paper or try to communicate with your neighbor. Violations of any type of this rule will lead to a score of 0 on this exam.
4. Solutions should be concise and clearly written. Incomprehensible work is worthless.

1. (30 pts) Find  $dy/dx$ . Simplify when possible (6 pts each):

(a)  $y = \frac{x^3}{3} - 2\sqrt{x} + 3\pi^{19}$

(b)  $y = x^2 e^{-3x}$

(c)  $y = \sqrt{1 + \sec^2 x}$

(d)  $y = \arctan(\ln x)$

(e)  $y = (x^2 + 1)^x$

2. (8 pts) If  $f(x) = \cos(3x)$ , determine  $f^{(2015)}(x)$ .

3. (10 pts) The function  $h(x)$  is given by  $h(x) = \frac{1+x^2}{f(x)}$ . Given that  $f(2) = 1$  and  $f'(2) = 5$ , find

(a) (3 pts)  $h(2)$

(b) (7 pts)  $h'(2)$

4. (12 pts) Find the equation of the tangent line to the curve  $3x^2 + 2xy^3 = 5y^2$  at the point  $(1, 1)$ .

5. (12 pts) Show that  $y = x \cos(3x)$  is a solution to  $y'' + 9y = -6 \sin(3x)$ .

6. (12 pts) A 13ft ladder is leaning against a wall. If the bottom of the ladder is pulled along the ground away from the wall at a constant rate of 0.12 ft/s, how fast will the top of the ladder be moving down the wall when it is 12ft above the ground?

7. (14 pts) Given the parametric curve  $x = \cos t$ ,  $y = 3 \sin t$ ,  $0 \leq t \leq 2\pi$ :

(a) (6 pts) Sketch the curve in the  $xy$  plane, marking the coordinates of axis intercepts and indicating orientation.

(b) (8 pts) Find the coordinates of a point on the curve (if any) with the property that the tangent line to the curve at that point is parallel to the line  $y = -\sqrt{3}x$ .

8. (12 pts) Choose ONE:

(a) State and prove the formula for the derivative of a product of two functions.

(b) Find, with proof, the formula for  $(\arcsin x)'$ .