NAME: ______________________________ **Panther ID:** ____________

Exam 2 - MAC 2311 Fall 2014

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) $y = \dfrac{x^3}{3} - 2\sqrt{x} + 10^6$

(b) $y = e^{3x} \sec x$

(c) $y = \dfrac{1}{2x + \sin^3 x}$

(d) $y = \arcsin(\cos x)$

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

2. (8 pts) If $f(x) = \sin(2x)$, determine $f^{(2014)}(x)$.

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

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

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

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

5. (14 pts) (a) (8 pts) Find the local linear approximation of the function $f(x) = \tan x$ at $x_0 = \pi/4$.

(b) (6 pts) Use the result of part (a) to estimate without calculator $\tan 47^\circ$. (OK for your answer to contain π.)

6. (12 pts) A rocket that is launched vertically is tracked by a radar station located on the ground 6 miles from the launch site. What is the vertical speed of the rocket at the instant its distance from the radar station is 10 miles and this distance increases at the rate of 3600 mi/h?

7. (12 pts) Given the parametric curve $x = t^2$, $y = t - 3$:

(a) (4 pts) Sketch the curve in the xy plane,
clearly indicating orientation.

(b) (8 pts) Find the tangent line to the curve at the point $(9, 0)$.

8. (12 pts) Choose ONE:
(a) State and prove the formula for the derivative of a product of two functions.

(b) Use the limit definition of the derivative to show that $(\sin x)' = \cos x$.