

NAME: _____

Panther ID: _____

Exam 2 - MAC 2311

Summer B 2017

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. (8 pts) The function $h(x)$ is given by $h(x) = \frac{x^2}{f(x)}$. It is known that $f(2) = 3$ and $f'(2) = 2$. Compute

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

(b) (6pts) $h'(2)$

2. (10 pts) Show that $y = e^{-x^2}$ satisfies the differential equation $y'' + 2xy' + ay = 0$ for a certain constant a that you should determine.

3. (30 pts) Find the derivative of each of the following functions. Simplify your answer when possible (6 pts each):

(a) $y = 5x^4 - \frac{4}{x} + \frac{e^3}{3}$

(b) $y = x \arctan(x^2)$

(c) $y = \ln(\sec x + \tan x)$

(d) $y = \sqrt{1 + \sin^2(3x)}$

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

3. (8 pts) These are True or False questions. Circle your answer. No justification necessary.

(a) If $y = \cos x$, then $y'' = -y$. **True** **False**

(b) If $y = g(u)$ and $u = h(x)$, then $\frac{dy}{dx} = g'(u) \cdot h'(x)$. **True** **False**

(c) $\left(\frac{1}{\tan x}\right)' = \frac{1}{\sec^2 x}$ **True** **False**

(d) If $f(x)$ is continuous at $x = 3$ then $f(x)$ is differentiable at $x = 3$. **True** **False**

4. (14 pts) (a) (8 pts) Use implicit differentiation to find dy/dx for the curve $x^2 + xy + y^2 = 3$.

(b) (6 pts) Find the coordinates of the point(s) on the curve $x^2 + xy + y^2 = 3$ where the tangent line vertical?

6. (10 pts) Use an appropriate local linear approximation to estimate $\cot(43^\circ)$. Be sure to specify the function and the point you are using for the approximation. OK if your answer contains π .

7. (12 pts) A rocket that is launched vertically is tracked by a radar station located on the ground 8 miles from the launch site. What is the vertical speed of the rocket at the instant when its distance from the radar station is 10 miles and this distance increases at the rate of 2400 mi/h?

8. (20 pts) Choose TWO of the following three options (10 pts each). Indicate clearly the two parts you choose.

(A) Use the limit definition of the derivative to find, with proof, the formula for $(\sin x)'$.

(B) Find, with proof, the formula for $(\arccos x)'$.

(C) Find, with proof, a formula for $(f(g(x)))''$ in terms of the first and second derivatives of f and g .