

Name: _____

Panther ID: _____

Homework 3 - Due Tuesday, Oct. 6

Calculus I

Fall 2015

1. (10 pts) Compute the derivative of each of the following functions (2.5pts each):

(a) $y = \sin x \tan(3x)$

(b) $y = \sin(\tan(3x))$

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

(d) $y = x \sec^2(\sqrt{x})$

2. (8 pts) Show that $y = \sin(3x^2)$ is a solution for the differential equation

$$y'' + 36x^2y = 6 \cos(3x^2) .$$

Hint: Carefully compute y' and y'' , then plug in y'' and y to check that the differential equation is satisfied.

3. (4 pts) Find a formula for

$$\frac{d}{dx}[f(g(h(x)))]$$

and briefly explain (showing the two steps process of finding the formula is already sufficient explanation).

4. (8 pts) A telescope on the ground is tracking a rocket which is rising vertically from a launchpad. The telescope is 50 kilometers from the launchpad.

(a) Sketch a triangle whose vertices are given by (i) the telescope, (ii) the launchpad, and (iii) the rocket. Do not assume that the rocket is on the launchpad.

(b) Write the altitude of the rocket h (i.e. height over the launchpad) as a function of the angle θ the telescope makes with the ground.

(c) Compute the rate of change of h with respect to the angle θ , when $\theta = \pi/6$. What are the units of your answer? Can you express your answer in *km/degree*?