

Name:

Math 115 Exam 2

October 28, 2013

1) Calculate f' for the following functions.

a) (8 points) $f(x) = \frac{\tan(x)}{-7x^2}$.

b) (10 points) $f(x) = \sec(\sqrt[3]{6x-1})$.

2) The position of a neutrino in CERN's particle accelerator is unrealistically given by $s(t) = 1,200(2t^3 - 15t^2 + 24t)$ where t is in seconds and s is in kilometers.

a) (8 points) Find an equation for the velocity v of the neutrino and evaluate $v(1)$.

b) (8 points) Find an equation for the acceleration a of the neutrino and determine the time value for when the acceleration is zero.

3) (15 points) If $\sin(xy) + y^2 = 1/2$, find the equation of the tangent line to the graph at the point $(0, 1/\sqrt{2})$.

4) Sasquatch is carrying his favorite (biodegradable) helium balloon when he is startled by a noise in the woods and releases his balloon. The balloon rises straight up at a rate of 1 meter per second. Bigfoot, who covets Sasquatch's balloon, has been lurking in wait 45 meters away from Sasquatch. When he sees Sasquatch let go of the balloon, he immediately begins to run towards Sasquatch at a rate of 12 meters per second. Assume Bigfoot and Sasquatch are the same height and that the balloon was at Sasquatch's head-level when it was released.

a) (2 points) How close is Bigfoot to Sasquatch 2 seconds after Sasquatch releases the balloon?

b) (5 points) Draw a picture representing the scenario above, labeling your variables, one of which should be the angle of elevation between Bigfoot and the balloon.

c) (6 points) Find an equation that relates the angle of elevation between Bigfoot and the balloon to some of the other variables in the problem.

d) (9 points) Determine how fast the angle of elevation between Bigfoot and the balloon is changing 2 seconds after Sasquatch releases it.

5) Evaluate the following limits.

a) (9 points) $\lim_{x \rightarrow 0} \frac{\sin(2x) - x}{5x + x^{3/2}}$

b) (10 points) $\lim_{\theta \rightarrow 0} \frac{\theta^4}{\sin^4(3\theta)}$