

## Math 124 Quiz #6 Answers

1. (a) Using the chain rule (and derivatives of exponential functions and  $\sec x$ ):

$$\frac{dy}{dx} = 11^{\sec x} \ln(11) \cdot \sec x \cdot \tan x$$

- (b) Using the chain rule and product rule:

$$f'(t) = \frac{1}{\sqrt{1-(e^t)^2}} \cdot e^t + 5(-3 + 2t^3)^6 + 5t \cdot 6(-3 + 2t^3)^5 \cdot 6t^2$$

2. Implicit Differentiation (Take derivatives of both sides with respect to  $x$ ):

$$8x^3 + e^y + xe^y \frac{dy}{dx} = -24y^7 \frac{dy}{dx} \quad (\text{Using the product rule on } xe^y)$$

When  $x = 1$  and  $y = 0$ :

$$8 + 1 + \frac{dy}{dx} = 0 \quad \Rightarrow \quad \frac{dy}{dx} = -9$$

Equation of the Line:  $\boxed{y = -9(x - 1) \quad \text{or} \quad y = -9x + 9}$

3. (a) Velocity =  $v = f'(t) = 10 \cos(\pi t) \cdot \pi = 10\pi \cos(\pi t)$

$$\text{Acceleration} = a = f''(t) = -10\pi \sin(\pi t) \cdot \pi = -10\pi^2 \sin(\pi t)$$

- (b) The maximum velocity is  $10\pi$  inches per second (when  $\cos(\pi t) = 1$ ).