NAME: Solutions

Math 21F Quiz V October 6, 2014
As always, show your method for solving each problem

1. Find the derivatives
   a. \( \frac{d}{dx}(\tan(742x)) = \sec^2(742x) \cdot 742 = 742 \sec^2(742x) \)

   b. \( \frac{d}{dx}(\ln(|\cos(x)|)) = \frac{1}{\cos(x)} \cdot \frac{d}{dx}(\cos(x)) = -\frac{\sin(x)}{\cos(x)} = -\tan(x) \)

   c. \( \frac{d}{dx}(e^{-x^2}) = e^{-x^2} \cdot \frac{d}{dx}(-x^2) = e^{-x^2} \cdot (-2x) = -2xe^{-x^2} \)

2a. Find \( \frac{dy}{dx} \) by implicit differentiation when \( xy + \sin(x) + 1 = e^y \). Using product rule on \( xy \):

   \[ x \frac{dy}{dx} + y \frac{d}{dx}(x + \sin(x)) + 0 = e^y \frac{dy}{dx} \]

   So \( x \frac{dy}{dx} + y + \cos(x) = e^y \frac{dy}{dx} \) and \( y + \cos(x) = (e^y - x) \frac{dy}{dx} \)

   \[ \frac{dy}{dx} = \frac{y + \cos(x)}{e^y - x} \]

   b. Find the equation of the tangent line to the graph at the point \((x, y) = (0, 0)\).

   \[ \frac{dy}{dx} = \frac{0 + \cos(0)}{e^0 - 0} = \frac{1}{1} = 1 = m \]

   \( y - 0 = 1(x - 0) \)

   \[ y = x \]