

Math 172 - Quiz 3

September 7, 2016

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary. YOU MUST WORK INDIVIDUALLY.

1. (3 points) Find an equation of the line tangent to the graph of $y = (\sin x)^{2x}$ at the point where $x = \pi/2$. (Hint: Use logarithmic differentiation.)

$$\ln y = 2x \ln \sin x$$

$$\frac{1}{y} \frac{dy}{dx} = 2 \ln \sin x + \frac{2x \cos x}{\sin x}$$

$$\frac{dy}{dx} = y \left(2 \ln \sin x + \frac{2x \cos x}{\sin x} \right)$$

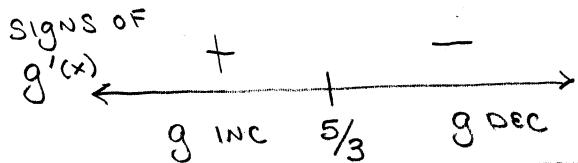
$$\text{When } x = \frac{\pi}{2}, \quad y = 1 \quad \& \quad \frac{dy}{dx} = 1 \left(0 + 0 \right) = 0$$

TANGENT LINE IS

$$y = 1$$

2. (4 points) Find the relative extreme values of the function $g(x) = -2 + e^{3x}(4 - 2x)$.

$$\begin{aligned} g'(x) &= 3e^{3x}(4-2x) - 2e^{3x} \\ &= 10e^{3x} - 6xe^{3x} \\ &= 2e^{3x}(5-3x) = 0 \\ \Rightarrow x &= \frac{5}{3} \end{aligned}$$



$$g\left(\frac{5}{3}\right) = -2 + \frac{2}{3}e^5 \approx 96.9$$

IS A REL MAX

3. (3 points) Evaluate the definite integral:

$$\int_{1/2}^1 \frac{5e^{1/x^2}}{x^3} dx$$

$$u = \frac{1}{x^2}$$

$$du = -\frac{2}{x^3} dx$$

$$-\frac{5}{2} du = \frac{5}{x^3} dx$$

$$x = \frac{1}{2} \Rightarrow u = 4$$

$$x = 1 \Rightarrow u = 1$$

$$= -\frac{5}{2} \int_4^1 e^u du$$

$$= -\frac{5}{2} e^u \Big|_4^1$$

$$= -\frac{5}{2} (e - e^4)$$

$$\approx 129.7$$