

# MAC2311 Class Number 15498

## QUIZ 6

### 2/21/2019

Name: SOLUTIONS

1. Compute the first and second derivatives for

$$1. f'(x) = \left[ \frac{d}{dx}(\sin(x)) \right] [e^{\sin(x)}] = \cos(x) e^{\sin(x)} \Rightarrow \boxed{f'(x) = \cos(x) e^{\sin(x)}} \quad \begin{matrix} f(x) = e^{\sin(x)} \\ \end{matrix}$$

$$2. f''(x) = \left[ \frac{d}{dx}(\cos(x)) \right] [e^{\sin(x)}] + [\cos(x)] \left[ \frac{d}{dx}(e^{\sin(x)}) \right] = \boxed{-\sin(x) e^{\sin(x)} + \cos^2(x) e^{\sin(x)}} \quad \begin{matrix} \uparrow \frac{d}{dx}(\cos(x)) \\ \uparrow \frac{d}{dx}(e^{\sin(x)}) \\ \uparrow f'(x) \end{matrix}$$

2. Calculate the derivative:

$$\begin{aligned} & \frac{d}{dx}(\sqrt{2x}) \\ &= \frac{d}{dx}((2x)^{1/2}) = \frac{1}{2} (2x)^{\frac{1}{2}-1} \left[ \frac{d}{dx}(2x) \right] \\ &= \frac{1}{2} (2x)^{-\frac{1}{2}} (2) \\ &= \frac{1}{\cancel{2} \sqrt{2x}} (2) = \boxed{\frac{1}{\sqrt{2x}}} \end{aligned}$$

3. Implicitly derive the expression  $\underbrace{3x^2 y^2}_{* \text{PRODUCT RULE!}} = -10$  and solve for  $\frac{dy}{dx}$ .

$$= \left[ \frac{d}{dx}(6x) \right] [y^2] + [3x^2] \left[ \frac{d}{dx}(2y) \right] = 0 \quad \begin{matrix} \uparrow \text{DERIVATIVE OF } 3x^2 \\ \uparrow \text{DERIVATIVE OF } y^2 \\ \uparrow \text{DERIVATIVE OF } -10 \end{matrix}$$

$$\begin{aligned} \Rightarrow 6xy^2 + 6x^2y \frac{dy}{dx} &= 0 \Rightarrow 6x^2y \frac{dy}{dx} = -6xy^2 \\ \Rightarrow \frac{dy}{dx} &= \frac{-6xy^2}{6x^2y} \Rightarrow \boxed{\frac{dy}{dx} = \frac{-y}{x}} \end{aligned}$$