



MA1021

Calculus I

B Term, 2014

Quiz 4

Print Name: _____

Sign: _____

Compute each of the following derivatives. Write up your solutions neatly and show all your work.

1. $\frac{d}{dx} (5x^2 + 3^7 - 3x^3 + \pi^\pi - x^\pi) =$

The terms 3^7 and π^π are constants, so their derivatives are zero. The rest follow the power rule: $\frac{d}{dx} (5x^2 + 3^7 - 3x^3 + \pi^\pi - x^\pi) = 5 \cdot 2x - 3 \cdot 3x^2 - \pi x^{\pi-1} = 10x - 9x^2 - \pi x^{\pi-1}$

2. $\frac{d}{dx} ((x^3 - 1) \sin(x)) =$

Product rule is in play:

$$\begin{aligned} \frac{d}{dx} ((x^3 - 1) \sin(x)) &= (x^3 - 1) \frac{d}{dx} \sin(x) + \sin(x) \frac{d}{dx} (x^3 - 1) \\ &= (x^3 - 1) \cos(x) + \sin(x) 3x^2 = (x^3 - 1) \cos(x) + 3x^2 \sin(x) \end{aligned}$$

$$3. \frac{d}{dx} \left(\frac{1-x^2}{1-3x^2} \right) =$$

$$\begin{aligned} \frac{d}{dx} \left(\frac{1-x^2}{1-3x^2} \right) &= \frac{(1-3x^2) \frac{d}{dx}(1-x^2) - (1-x^2) \frac{d}{dx}(1-3x^2)}{(1-3x^2)^2} = \frac{(1-3x^2)(-2x) - (1-x^2)(6x)}{(1-3x^2)^2} \\ &= \frac{(2x)[-(1-3x^2) - (1-x^2)(3)]}{(1-3x^2)^2} = \frac{(2x)[-1+3x^2-3+3x^2]}{(1-3x^2)^2} = \frac{(2x)(6x^2-4)}{(1-3x^2)^2} \end{aligned}$$

$$4. \frac{d}{dx} (\sin^2(\sqrt{1-3x})) =$$

$$\begin{aligned} 2 \sin(\sqrt{1-3x}) \frac{d}{dx} (\sin(\sqrt{1-3x})) &= \\ 2 \sin(\sqrt{1-3x}) \cos(\sqrt{1-3x}) \frac{d}{dx} \sqrt{1-3x} &= \\ 2 \sin(\sqrt{1-3x}) \cos(\sqrt{1-3x}) \frac{d}{dx} (1-3x)^{1/2} &= \\ 2 \sin(\sqrt{1-3x}) \cos(\sqrt{1-3x}) (1/2) (1-3x)^{-1/2} \frac{d}{dx} (1-3x) &= \\ 2 \sin(\sqrt{1-3x}) \cos(\sqrt{1-3x}) (1/2) (1-3x)^{-1/2} (-3) &= \\ \frac{-3 \sin(\sqrt{1-3x}) \cos(\sqrt{1-3x})}{\sqrt{1-3x}} &= \end{aligned}$$