Name: Richard

QUIZ 10

MATH 200
September 24, 2024

**Directions:** Differentiate the following functions.

1. $y = \sec(x^5) + \sec^5(x)$ $= \sec(x^5) + (\sec(x))^5$

$$\frac{dy}{dx} = \sec(x^5)\tan(x^5)\,5x^4 + 5(\sec(x))^4 \sec(x)\tan(x)$$

$$= \boxed{5x^4\sec(x^5)\tan(x^5) + 5\sec^5(x)\tan(x)}$$

2. $y = \left(\frac{x^3 - x^2}{\sin(x)}\right)^4$

$$\frac{dy}{dx} = \boxed{4\left(\frac{x^3 - x^2}{\sin(x)}\right)^3 \frac{(3x^2 - 2x)\sin(x) - (x^3 - x^2)\cos(x)}{\sin^2(x)}}$$

3. $y = \frac{2}{x^4 - 3x^3}$ $= 2(x^4 - 3x^3)^{-1}$

$$\frac{dy}{dx} = -2(x^4 - 3x^3)^{-2}(4x^3 - 9x^2) = \boxed{\frac{18x^2 - 8x^3}{(x^4 - 3x^3)^2}}$$

4. $y = x^5 - \sqrt{\tan(x^3)}$ $= x^5 - (\tan(x^3))^{\frac{1}{2}}$

$$\frac{dy}{dx} = 5x^4 - \frac{1}{2}(\tan(x^3))^{-\frac{1}{2}} D_x[\tan(x^3)]$$

$$= \boxed{5x^4 - \frac{\sec^2(x^3)\,3x^2}{2\sqrt{\tan(x^3)}}}$$

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**Directions:** Differentiate the following functions.

1. $y = e^{\cos(x)} + \cos(e^x)$

$$\frac{dy}{dx} = e^{\cos(x)}(-\sin(x)) - \sin(e^x)e^x$$

$$= \boxed{-\sin(x)e^{\cos(x)} - \sin(e^x)e^x}$$

2. $y = (x^2 + 3x - 4)^{100}$

$$\frac{dy}{dx} = \boxed{100(x^2+3x-4)^{99}(2x+3)}$$

3. $y = \frac{2}{5}\sqrt{e^{5x} + 5x}$ $= \frac{2}{5}(e^{5x} + 5x)^{\frac{1}{2}}$

$$\frac{dy}{dx} = \frac{2}{5} \cdot \frac{1}{2}(e^{5x} + 5x)^{-1/2}(e^{5x} \cdot 5 + 5)$$

$$= \frac{1}{5} \frac{1}{(e^{5x}+5x)^{1/2}} 5(e^{5x}+1) = \boxed{\frac{e^{5x}+1}{\sqrt{e^{5x}+5x}}}$$

4. $y = x^4 + \left(e^x + \frac{x^3-1}{x+1}\right)^4$

$$\frac{dy}{dx} = 4x^3 + 4\left(e^x + \frac{x^3-1}{x+1}\right)^3 D_x\left[e^x + \frac{x^3+1}{x+1}\right]$$

$$= \boxed{4x^3 + 4\left(e^x + \frac{x^3-1}{x+1}\right)^3\left(e^x + \frac{3x^2(x+1) - (x^3+1)\cdot 1}{(x+1)^2}\right)}$$