Name: Richard

QUIZ 10

MATH 200
September 26, 2023

Directions: Differentiate the following functions.

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

$$y' = 0 + 5x^4 + e^{x^2+\sin(x)}\left(2x+\cos(x)\right)$$

$$= \boxed{5x^4 + (2x+\cos(x))e^{x^2+\sin(x)}}$$

2. $y = \left(\frac{x+x^2}{1+x^3}\right)^{10}$

$$y' = 10\left(\frac{x+x^2}{1+x^3}\right)^9 \frac{(1+2x)(1+x^3)-(x+x^2)(0+3x^2)}{(1+x^3)^2}$$

$$= 10\left(\frac{x+x^2}{1+x^3}\right)^9 \frac{1+x^3+2x+2x^4-3x^3-3x^4}{(1+x^3)^2} = \boxed{10\left(\frac{x+x^2}{1+x^3}\right)^9 \frac{1+2x-2x^3-x^4}{(1+x^3)^2}}$$

3. $y = \sin^3(4x) = (\sin(4x))^3$

$$y' = 3(\sin(4x))^2 D_x[\sin(4x)] = 3\sin^2(4x)\cos(4x)\cdot 4$$

$$= \boxed{12\sin^2(4x)\cos(4x)}$$

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

$$y' = \frac{1}{2}(x^2+e^{5x})^{-1/2} D_x[x^2+e^{5x}] = \frac{1}{2(x^2+5x)^{1/2}}(2x+e^{5x}\cdot 5)$$

$$= \boxed{\frac{2x+5e^{5x}}{2\sqrt{x^2+5x}}}$$

5. $y = xe^{-x}$

$$y' = D_x[xe^{-x}] = D_x[x]e^{-x} + x D_x[e^{-x}]$$

$$= 1\cdot e^{-x} + xe^{-x}(-1)$$

$$= \boxed{e^{-x} - xe^{-x}}$$

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Directions: Differentiate the following functions.

1. $y = \frac{1}{3}e^{x^3+3x}$

$$y' = \frac{1}{3} e^{x^3+3x}(3x^2+3) = \boxed{e^{x^3+3x}(x^2+1)}$$

2. $y = (2+3e^x)^5$

$$y' = 5(2+3e^x)^4 D_x[2+3e^x]$$
$$= 5(2+3e^x)^4(0+3e^x) = \boxed{15e^x(2+3e^x)^4}$$

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

$$\frac{dy}{dx} = \frac{1}{2}(x+\sin(x))^{-\frac{1}{2}} D_x[x+\sin(x)]$$
$$= \frac{1}{2(x+\sin(x))^{1/2}}(1+\cos(x)) = \boxed{\frac{1+\cos(x)}{2\sqrt{x+\sin(x)}}}$$

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

$$y' = -(\tan(3x+1))^{-2} D_x[\tan(3x+1)]$$
$$= -\frac{1}{\tan^2(3x+1)}\sec^2(3x+1)\cdot 3 = \boxed{-\frac{3\sec^2(3x+1)}{\tan^2(3x+1)}}$$
$$= \boxed{-3\sin^2(3x+1)}$$

5. $y = \sec(e^x) + e^{\sec(x)}$

$$y' = \boxed{\sec(e^x)\tan(e^x)e^x + e^{\sec(x)}\sec(x)\tan(x)}$$