Name: ______________________________

QUIZ 10

MATH 200
February 22, 2022

Directions: Differentiate the following functions.

1. $y = e^{x/2}$

$$D_x\left[e^{x/2}\right] = e^{x/2} D_x\left[\frac{x}{2}\right] = e^{x/2}\frac{1}{2} = \boxed{\frac{e^{x/2}}{2}}$$

2. $y = \cos^5(x)$

$$D_x\Big[\cos^5(x)\Big] = D_x\Big[(\cos(x))^5\Big] = 5\,(\cos(x))^4\, D_x\Big[\cos(x)\Big] = 5\,(\cos(x))^4\,(-\sin(x)) = \boxed{-5\cos^4(x)\sin(x)}$$

3. $y = \Big(1 + \tan(e^x)\Big)^{10}$

$$D_x\Big[(1+\tan(e^x))^{10}\Big] = 10\,(1+\tan(e^x))^9\, D_x\Big[1+\tan(e^x)\Big] =$$

$$10\,(1+\tan(e^x))^9\,\Big(0 + \sec^2(e^x) D_x\big[e^x\big]\Big) = \boxed{10\,(1+\tan(e^x))^9 \sec^2(e^x) e^x}$$

4. $y = x^2\, e^{\sin(x)}$

$$D_x\Big[x^2\, e^{\sin(x)}\Big] = 2x\, e^{\sin(x)} + x^2\, D_x\Big[e^{\sin(x)}\Big] \qquad \text{(product rule)}$$

$$= \boxed{2x\, e^{\sin(x)} + x^2 e^{\sin(x)}\cos(x)} \qquad \text{(chain rule)}$$

5. $y = \sec(x^2) + \sec^2(x)$

$$D_x\Big[\sec(x^2) + \sec^2(x)\Big] = \sec(x^2)\tan(x^2) D_x\Big[x^2\Big] + 2\,(\sec(x))^1\, D_x\Big[\sec(x)\Big]$$

$$= 2x\,\sec(x^2)\tan(x^2) + 2\sec(x)\sec(x)\tan(x) = \boxed{2x\sec(x^2)\tan(x^2) + 2\sec^2(x)\tan(x)}$$

Name: ______________________________ **Quiz 10** MATH 200

February 22, 2022

Directions: Differentiate the following functions.

1. $y = 3e^{-x}$

$$D_x\Big[3e^{-x}\Big] = 3\,D_x\Big[e^{-x}\Big] = 3e^{-x}D_x\Big[-x\Big] = 3e^{-x}(-1) = \boxed{-3e^{-x}}$$

2. $y = \cos\left(e^{x^2+x}\right)$

$$D_x\Big[\cos\left(e^{x^2+x}\right)\Big] = -\sin\left(e^{x^2+x}\right)D_x\Big[e^{x^2+x}\Big] \quad = \quad \boxed{-\sin\left(e^{x^2+x}\right)e^{x^2+x}(2x+1)}$$

3. $y = (x + \sin(x)\,)^8$

$$D_x\Big[\,(x+\sin(x)\,)^8\Big] \quad = \quad 8\,(x+\sin(x)\,)^7\,D_x\Big[x+\sin(x)\Big] \qquad \text{(generalized power rule)}$$

$$= \quad \boxed{8\,(x+\sin(x)\,)^7\,(1+\cos(x))}$$

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

$$y' = \frac{D_x\Big[e^x\Big]\tan(3x+1) - e^x\,D_x\Big[\tan(3x+1)\Big]}{\tan^2(3x+1)} \qquad \text{(quotient rule)}$$

$$= \quad \frac{e^x\tan(3x+1) - e^x\,\sec^2(3x+1)(3+0)}{\tan^2(3x+1)}$$

$$= \quad \boxed{\frac{e^x\tan(3x+1) - 3e^x\,\sec^2(3x+1)}{\tan^2(3x+1)}}$$

5. $y = \sec(x^3) + \sec^3(x) \qquad = \quad \sec\left(x^3\right) + (\sec(x))^3$

$$y' = D_x\Big[\sec(x^3)+\sec^3(x)\Big] = D_x\Big[\sec(x^3)+(\sec(x))^3\Big] = D_x\Big[\sec(x^3)\Big] + D_x\Big[(\sec(x))^3\Big]$$

$$= \sec(x^3)\tan(x^3)D_x\Big[x^3\Big] + 3\,(\sec(x))^2\,D_x\Big[\sec(x)\Big]$$

$$= \sec(x^3)\tan(x^3)3x^2 + 3\,(\sec(x))^2\sec(x)\tan(x)$$

$$= \quad \boxed{3x^2\sec(x^3)\tan(x^3) + 3\sec^3(x)\tan(x)}$$