Math 2215 - Calculus 1

Homework #4 - 2005.09.22

Due Date - 2005.09.27

Solutions

Compute the following derivatives and simplify where possible:

1. $\frac{d}{dx}\sqrt{\frac{1+x^2}{1-x^2}}$

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

2. $\frac{d}{dy}e^{\frac{1}{y}}\sin(y)$

$$\frac{d}{dy}e^{\frac{1}{y}}\sin(y) = e^{\frac{1}{y}}\left(\cos(y) - \frac{1}{y^2}\sin(y)\right)$$

3. $\frac{d}{dz}z^2\cos\left(z^2\right)$

$$\frac{d}{dz}z^2\cos\left(z^2\right) = 2z\cos\left(z^2\right) - 3z^3\sin\left(z^2\right)$$

4. $\frac{d}{dx}\sqrt{e^{x^2}+\cos(2x+3)}$

$$\frac{d}{dx}\sqrt{e^{x^2}+\cos(2x+3)} = \frac{1}{2}\frac{1}{\sqrt{e^{x^2}+\cos(2x+3)}}\left(2xe^{x^2} - 2\sin(2x+3)\right)$$

5. $\frac{d}{dy}\sec^3\left(y^3\right)$

$$\frac{d}{dy}\sec^3\left(y^3\right) = 9y^2\sec^2\left(y^3\right)\sec\left(y^3\right)\tan\left(y^3\right)$$

6. $\frac{d}{dz}2^{3z^2+1}$

$$\frac{d}{dz}2^{3z^2+1} = 2^{3z^2+1}6z\ln(2)$$

7. $\frac{d}{dx}\frac{e^{x^2+x}+1}{e^{x^2+x}-1}$

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

8. $\frac{d}{dy}\frac{e^y+e^{-y}}{e^y-e^{-y}}$

$$\frac{d}{dy}\frac{e^y+e^{-y}}{e^y-e^{-y}} = -\frac{4}{\left(e^y-e^{-y}\right)^2}$$

9. $\frac{d}{dz}\sin\left(\cos\left(\tan\left(z\right)+z\right)+z\right)$

$$\frac{d}{dz}\sin\left(\cos\left(\tan\left(z\right)+z\right)+z\right) = \cos(\cos(\tan(z)+z)+z)(-\sin(\tan(z)+z)(1+\sec(z)^2)+1)$$

10. $\frac{d}{dx}e^{2x^2+12x-4}\cos\left(2x^2\right)\sin\left(4x^3\right)$

$$\begin{aligned}\frac{d}{dx}e^{2x^2+12x-4}\cos\left(2x^2\right)\sin\left(4x^3\right) = \\ 4e^{2x^2+12x-4}\big[(x+3)\cos\left(2x^2\right)\sin\left(4x^3\right) \\ -x\sin\left(2x^2\right)\sin\left(4x^3\right)+3x^2\cos\left(2x^2\right)\cos\left(4x^3\right)\big]\end{aligned}$$

11. $\frac{d}{dy}\frac{1+\sin(y)}{1-\sin(y)}$

$$\frac{d}{dy}\frac{1+\sin(y)}{1-\sin(y)} = \frac{2\cos(y)}{\left(\sin(y)-1\right)^2}$$

12. $\frac{d}{dz}e^{z^2+2}e^{2z-1}$

$$\frac{d}{dz}e^{z^2+2}e^{2z-1} = 2\left(z+1\right)e^{(z+1)^2}$$

13. $\frac{d}{dy}7^{3y^2+\tan(y)}$

$$\frac{d}{dy}7^{3y^2+\tan(y)} = 7^{3y^2+\tan(y)}\left(6y+\sec^2(y)\right)\ln(7)$$

14. $\frac{d}{dz}\tan^4\left(z^3\right)\cot^4\left(z^3\right)$

$$\frac{d}{dz}\tan^4\left(z^3\right)\cot^4\left(z^3\right) = 0$$

15. $\frac{d}{dx}\left(\frac{e^{x^2}+\cos(x)}{\sin(x)+1}\right)^7$

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