Mastery Test Review Form MAT 265

Answers appear in **red.** **45 questions.**

"Differentiate the following functions (i.e., find $\frac{dy}{dx}$)"

Section 2.3 Basic Derivative Formulas – Power Rule and sine and cosine functions

1. $y = 7\sin x + 12\tan x - x^3$ $\quad y' = 7\cos x + 12(secx)^2 - 3x^2$

2. $y = x^{6.5} - \frac{1}{x^{7.5}}$ $\quad y' = 6.5x^{5.5} + \frac{7.5}{x^{8.5}}$

3. $y = \tan(e^{\pi})$ $\quad y' = 0$

4. $y = \sqrt{7x} + \sqrt{5x}$ $\quad y' = \sqrt{7} + \frac{\sqrt{5}}{2\sqrt{x}}$

5. $y = 3 + \frac{8}{x} + \frac{410}{x^2}$ $\quad y' = -\frac{8}{x^2} - \frac{820}{x^3}$

6. $y = \sqrt[4]{x^9} + 2\sqrt{x^5}$ $\quad y' = \frac{9x^{\frac{5}{4}}}{4} + 5x^{\frac{3}{2}}$

Section 2.4 Product Rule, Quotient Rule (to include other 4 trig functions)

7. $y = \tan x - 11\csc x$ $\quad y' = sec^2 x + 11\csc x \cot x$

8. $y = \cos x + \cot x$ $\quad y' = -\sin x - \csc^2 x$

9. $y = \frac{1}{\sec(x)}$ $\quad y' = -\sin(x)$

10. $y = \frac{\sqrt{x}-5}{\sqrt{x}+6}$ $\quad \boldsymbol{y' = \frac{11}{2\sqrt{x}(\sqrt{x}+6)^2}}$

11. $y = \frac{\tan(x)}{6x\sec(x)}$ $\quad \boldsymbol{y' = \frac{x\sec^2(x) - tan\,x\,(x\tan x + 1)}{6x^2\sec(x)}}$

12. $y = \frac{\csc x}{4+x^5}$ $\quad y' = \frac{-\cot x\ \csc x\,(4+x^5) - 5x^4\csc x}{(4+x^5)^2}$

Section 2.5 Chain Rule

13. $y = (3x+4)^5(6x+7)^8$ $y' = 15(3x+4)^4(6x+7)^8 + 48(3x+4)^5(6x+7)^7$

14. $y = \frac{2+x}{(2-x)^5}$ $y' = \frac{4(3+x)}{(2-x)^6}$

15. $y = (2x+5)^{-6}$ $y' = -\frac{12}{(2x+5)^7}$

16. $y = \sin(\sec x)$ $y' = \cos(\sec x) \cdot \sec x \tan x$

17. $y = \frac{7}{\sqrt{x^4+3}}$ $y' = -\frac{14x^3}{(x^4+3)^{1.5}}$

18. $y = 6\cos^8 x$ $y' = -48(\cos x)^7 \sin x$

19. $y = \cos^2(x^7)$ $y' = -14x^6 \cos(x^7)\sin(x^7)$

20. $y = (x^3+4x+5)^{-6}$ $y' = \frac{-6(3x^2+4)}{(x^3+4x+5)^7}$

21. $y = \frac{2000}{\sin(3x)}$ $y' = -\frac{6000\cos(3x)}{(\sin x)^2(3x)}$

22. $y = \sec(3x)$ $y' = 3\sec(3x)\tan(3x)$

23. $y = (\sin(x))^5$ $y' = 5(\sin(x))^4 \cos(x)$

24. $y = \sin(x^5)$ $y' = 5x^4 \cos(x^5)$

Section 2.6 Implicit Differentiation

25. $2xy + y^{10} = 11$ $y' = -\frac{y}{x+5y^9}$

26. $xy^3 + 10y^{11} = 9$ $y' = -\frac{y}{3x+110y^8}$

27. $y = \sin(2xy)$ $y' = \frac{2y\cos(2xy)}{-2x\cos(2xy)+1}$

28. $3x = y + (2x - y)^2$ $y' = \frac{3-8x+4y}{2y+1-4x}$

29. $2\cos y = 7x \sin y + 7\sin(2y)$ $y' = -\frac{7 \sin y}{7x \cos y + 2 \sin y + 14 \cos(2y)}$

30. $5\cos y / \sin(x) = 1$ $y' = -\frac{\cos y \cos x}{\sin y \sin x}$

Section 3.3 Derivatives of Exponential and Logarithmic Functions

31. $y = x^5 e^{2x}$ $y' = (5 + 2x)x^4 e^{2x}$

32. $y = \frac{x^6\sqrt{x+2}}{(x+7)(x+5)^6}$ $y' = \frac{x^6\sqrt{x+2}}{(x+7)(x+5)^6}\left(\frac{6}{x} + \frac{1}{2(x+2)} - \frac{1}{x+7} - \frac{6}{x+5}\right)$

33. $y = \ln((x^6 + 2x)^4)$ $y' = \frac{4(6x^5+2)}{x^6+2x}$

34. $y = \ln(\sqrt[8]{(x+6)(x+7)(x^9+10)})$ $y' = \frac{1}{8}\left(\frac{1}{x+6} + \frac{1}{x+7} + \frac{9x^8}{x^9+10}\right)$

35. $y = 11^{\csc x}$ $y' = -11^{\csc x} \cdot \csc x \cot x \cdot \ln(11)$

36. $y = x^{\sqrt[8]{x}}$ $y' = x^{\sqrt[8]{x}}\left(\frac{\ln x}{8\sqrt[8]{x^7}} + \frac{1}{\sqrt[8]{x^7}}\right)$

37. $y = 100x^6 + e^{10x} + e^4$ $y' = 600x^5 + 10e^{10x}$

38. $y = 4^{x \tan x}$ $y' = 4^{x \tan x} \cdot (\tan x + x \sec^2 x) \ln 4$

39. $y = \ln[x^{11}(x+12)^{13}(x^8+9)^{10}]$ $y' = \frac{11}{x} + \frac{13}{x+12} + \frac{80x^7}{x^8+9}$

40. $y = \sec^9(2^x)$ $y' = 9 \ln 2 \; 2^x \sec^9(2^x) \tan(2^x)$

Section 3.5 Inverse Trigonometric Functions

41. $y = \arccos(x^4)$ $y' = -\frac{4x^3}{\sqrt{1-x^8}}$

42. $y = \tan^{-1}\left(\frac{2}{x^3}\right)$ $y' = -\frac{6x^2}{x^6+4}$

43. $y = \arcsin(e^x)$ $y' = \frac{e^x}{\sqrt{1-e^{2x}}}$

44. $y = \arccos(2 + x)$ $y' = -\frac{1}{\sqrt{-x^2-4x-3}}$

45. $y = 9x \arcsin(x)$ $y' = 9(\arcsin x + \frac{x}{\sqrt{1-x^2}}$