

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

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

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

$$3. y = \tan(e^\pi) \qquad y' = 0$$

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

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

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

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

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

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

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

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

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

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

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. $y = \frac{2+x}{(2-x)^5}$

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

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. $y = x^{\sqrt[8]{x}}$

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

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. $y = \sec^9(2^x)$

$$y' = 9 \ln 2 \cdot 2^x \sec^9(2^x) \tan(2^x)$$

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. $y = 9x \arcsin(x)$

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