

The Weekly Rigor

No. 167

“A mathematician is a machine for turning coffee into theorems.”

September 2, 2017

101 Problems in Calculating Derivatives Using the Chain Rule with Solutions (Part 3)

SET 1 ANSWERS

$$1. f'(x) = 8x(x^2 + 3)^3$$

$$2. f'(x) = 3x\sqrt{x^2 + 2}$$

$$3. f'(x) = 5x(x^3 + x^2 + 2)^4(3x + 2)$$

$$4. f'(x) = \frac{5x}{3}(3x + 2)^3\sqrt{(x^3 + x^2 + 4)^2}$$

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

$$6. f'(x) = \frac{-x(3x+2)}{2\sqrt{(x^3+x^2+1)^3}}$$

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

$$8. f'(x) = \frac{-5(4x^3+1)}{6^6\sqrt{(x^4+x)^{11}}}$$

$$9. f'(x) = \frac{-3x(5x^3+2)}{7^7\sqrt{(x^5+x^2)^{10}}}$$

$$10. f'(x) = \frac{x}{\sqrt{x^2+3}}$$

$$11. f'(x) = \frac{x(3x+2)}{4^4\sqrt{(x^3+x^2+4)^3}}$$

$$12. f'(x) = \frac{2(2x+1)}{3^3\sqrt{x^2+x}}$$

$$13. f'(x) = \frac{9}{2}x^2\sqrt{x^3 + 4}$$

$$14. f'(x) = \frac{-1}{3^3\sqrt{(x-1)^4}}$$

$$15. f'(x) = \frac{-5(3x^2+1)}{2\sqrt{(x^3+x)^7}}$$

$$16. f'(x) = 3\left(\frac{x^2+3}{x+1}\right)^2\left(\frac{(x+3)(x-1)}{(x+1)^2}\right)$$

$$17. f'(x) = 44\left(\frac{x-3}{x+8}\right)^3$$

$$18. f'(x) = 5\left(\frac{x^2-4}{x^3+7}\right)^4\left(\frac{-x^4+14x+12x^2}{(x^3+7)^2}\right)$$

$$19. f'(x) = 3\left(\frac{x^4-x^5}{x^2+x^3}\right)^2\left(\frac{x^5(4-5x)(1+x)-x^5(1-x)(2+3x)}{(x^2+x^3)^2}\right)$$

$$20. f'(x) = 3\left(x^{\frac{2}{3}} + x^{\frac{1}{2}}\right)^2\left(\frac{2}{3}x^{-\frac{1}{3}} + \frac{1}{2}x^{-\frac{1}{2}}\right)$$

$$21. f'(x) = \frac{4}{3}\left(x^{\frac{1}{2}} + x^{\frac{2}{3}}\right)^{\frac{1}{3}}\left(\frac{1}{2}x^{-\frac{1}{2}} + \frac{2}{3}x^{-\frac{1}{3}}\right)$$

$$22. f'(x) = \frac{4}{3}\left(x^{\frac{5}{3}} + x^{\frac{9}{10}}\right)^{\frac{1}{3}}\left(\frac{5}{3}x^{\frac{2}{3}} + \frac{9}{10}x^{-\frac{1}{10}}\right)$$

$$23. f'(x) = \frac{2}{15}x^{-\frac{1}{3}}\left(1 + x^{\frac{2}{3}}\right)^{-\frac{4}{5}}$$

$$24. f'(x) = \frac{1}{4}\left(x^{\frac{1}{2}} + x^{\frac{4}{3}}\right)^{-\frac{3}{4}}\left(\frac{1}{2}x^{-\frac{1}{2}} + \frac{4}{3}x^{\frac{1}{3}}\right)$$

$$25. f'(x) = -4 \left(x^{\frac{3}{4}} + x^{\frac{1}{2}} \right)^{-5} \left(\frac{3}{4} x^{-\frac{1}{4}} + \frac{1}{2} x^{-\frac{1}{2}} \right)$$

$$27. f'(x) = -\frac{1}{4} \left(x^{\frac{1}{2}} + x \right)^{-\frac{5}{4}} \left(\frac{1}{2} x^{-\frac{1}{2}} + 1 \right)$$

$$29. f'(x) = 3e^{3x}$$

$$31. f'(x) = 2xe^{x^2}$$

$$33. f'(x) = e^{x+e^x}$$

$$35. f'(x) = 1$$

$$37. f'(x) = \frac{e^{\arctan(x)}}{1+x^2}$$

$$39. f'(x) = 3(e^x + e^{-x})^2(e^x - e^{-x})$$

$$41. f'(x) = \frac{1}{x}$$

$$43. f'(x) = \frac{2}{x}$$

$$45. f'(x) = \frac{2 \ln(x)}{x}$$

$$47. f'(x) = \frac{20 \ln^3(3x^5)}{x}$$

$$49. f'(x) = 2x$$

$$51. f'(x) = \frac{1}{x \ln(x)}$$

$$26. f'(x) = 2 \left(x^{\frac{1}{3}} + x^2 \right) \left(\frac{1}{3} x^{-\frac{2}{3}} + 2x \right)$$

$$28. f'(x) = -\frac{2}{5} \left(x^{\frac{1}{2}} + x^{\frac{1}{3}} \right)^{-\frac{7}{5}} \left(\frac{1}{2} x^{-\frac{1}{2}} + \frac{1}{3} x^{-\frac{2}{3}} \right)$$

$$30. f'(x) = \frac{2}{5} e^{\frac{2}{5}x}$$

$$32. f'(x) = 3x^2 e^{x^3}$$

$$34. f'(x) = 2e^{2x+e^{2x}}$$

$$36. f'(x) = 2x$$

$$38. f'(x) = \frac{2e^{\arcsin(2x)}}{\sqrt{1-4x^2}}$$

$$40. f'(x) = -\frac{1}{2} e^{2x} (2 - 3e^x) (e^{2x} - e^{3x})^{-\frac{3}{2}}$$

$$42. f'(x) = \frac{1}{x}$$

$$44. f'(x) = \frac{2}{x}$$

$$46. f'(x) = \frac{3 \ln^2(5x)}{x}$$

$$48. f'(x) = 1$$

$$50. f'(x) = \frac{1}{x \ln(x)}$$

“Only he who never plays, never loses.”