The Weekly Rigor

101 Problems in Calculating Derivatives Using the Chain Rule with Solutions
(Part 14)

SET 3 ANSWERS

1. $f'(x) = \dfrac{2(2x+1)}{3\sqrt[3]{x^2+x}}$

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

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

4. $f'(x) = \dfrac{2}{x}$

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

6. $f'(x) = -2\left(\ln^2(x^5) - \ln(x)\right)^{-3}\left(\dfrac{10\ln(x^5)+1}{x}\right)$

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

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

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

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

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

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

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

14. $f'(x) = \dfrac{2}{x}$

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

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

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

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

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

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

21. $f'(x) = \dfrac{1}{x}$

22. $f'(x) = \dfrac{-1}{3\sqrt[3]{(x-1)^4}}$

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

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

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

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

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

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

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

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

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

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

33. $f'(x) = 1$

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

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

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

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

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

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

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

41. $f'(x) = \frac{6(\ln(2x)+\ln(x))^2}{x}$

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

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

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

45. $f'(x) = 9x^2(x^3 + 1)^2(5 + x^2)^4 + 8x(x^3 + 1)^3(5 + x^2)^3$

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

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

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

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

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

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

52. $f'(x) = 1$

53. $f'(x) = 8x(x^2 + 3)^3(x^2 + 2)^{\frac{3}{2}} + 3x(x^2 + 3)^4(x^2 + 2)^{\frac{1}{2}}$

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

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

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