

Ch. 4 Sec. 4

Differentiate each function of x:

1. $(x^2 + 5)^{10}$

2. $\ln(x^2 + 5)$

3. e^{x^2+5}

4. $(\ln(x) + 1)^9$

5. $(e^x + 1)^7$

6. $(2^x + 1)^7$

7. e^{2x+7}

8. $\ln(e^{2x} + 7)$

9. $\sqrt{x^5 + 19}$

10. $\frac{5}{e^x - 7}$

11. $(\ln(2^x + 1))^9$

12. $(\log(2^x + 1))^9$

13. $e^{(\ln(x)+1)^5}$

14. e^{5x}

15. $(7e^{3x} - 1)^{12}$

16. $(5x + 1)^{17}$

17. $(5x^2 + 1)^{17}$

18. $7 \cdot \ln(x^9 + 1)$

19. $5 \cdot \log(e^{3x} + 7)$

20. $\sqrt{11} \cdot e^{(3x^2)}$

21. $3\sqrt{7}x^5 - 2.1x^3 + x^{3.6} - 2x^{-1.3} + e^e$

22. $e^{(7x^3+2x+3)}$

23. $e^{(\ln(x)+32)^7}$

24. $7(2x^5 + \pi)^{53}$

25. $12(e^{7x} + 1)^9$

26. $5(\ln(x+1) + 8)^{10}$

27. $7(x + 8e^{2x})^5$

28. $7 \cdot \ln(3x^2 + x - \pi)$

29. $2 \cdot \ln(e^{3x} + 1.6)$

30. $3 \cdot \ln(\ln(x) + 1)$

31. $2e^{5x} + 7$

32. $3e^{2x^5+1}$

33. $5 \cdot 2^{x^4+1}$

34. $9e^{\ln(x)+53}$

35. $10e^{(e^x)}$

36. $\ln\left((e^x + 1)^5 + 2\right)$

37. $(\ln(e^x + 7) + 2)^5$

38. $(e^{\ln(x)+53})^7$

39. $\ln\left(e^{3x^2+2x-9} + 1\right)$

40. $\log_2(e^x + 1)$

41. $f(x) = (x^2 + 5)^{10}$

42. $f(x) = (2^x + 1)^7$

43. $f(x) = (x^3 + 5)^{10}$

44. $f(x) = (2^x + 1)^6$

45. $f(x) = (4x^2 + 5x + 3)^{-2}$

46. $(\sqrt{x} - 2x)^4$

Chain Rule, Exponential and Logarithmic Functions

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47. $f(x) = e^{5x^2}$

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

49. $f(x) = (x^2 + 5)^{10}$

50. $f(x) = (x^3 + 5)^{10}$

51. $f(x) = (x^2 + 5)^{10}$

52. $f(x) = (1.3^x + 5)^7$

53. $f(x) = (3x^4 + 5)^7$

54. $f(x) = e^{(3x^5)}$

55. $f(x) = 10^{(3x^5)}$

56. $f(x) = (3e^x + 7)^9$

57. $(5\ln(x) + 7)^3$

58. $f(x) = \ln(3x^7 + 1)$

59. $f(x) = \ln\left(e^{(x^2)} + 1\right)$

60. $f(x) = \ln((3x + 1)^5 + 1)$

61. $f(x) = \ln((x + 1)^5 + 7)$

62. The percentage of children living with their grandparents between 1970 and 2000 can be modeled by the equation $p(t) = [3 + 0.216e^{0.09263t}]$ percent t years after 1970. Write a rate of change formula for p . How rapidly was the percentage of children living with their grandparents growing in 1995?

63. Imagine that you invest \$1500 in a savings account at 4% annual interest compounded continuously. Write an equation for the balance in the account after t years. Write an equation for the rate of change of the balance. What is the rate of change of the balance at the end of 1 year? 2 years?

64. In October of 1999, iGo Corp. offered 5 million shares of public stock at \$9 per share. Revenue for the two years preceding the stock offering can be modeled by the equation

$R(q) = 2.9 + 0.0314e^{0.622285q}$ million dollars q quarters after the beginning of 1998. Write the rate of change formula of R . Calculate revenue and rate of change of revenue for June 1998, June 1999, June 2000.

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Answers:

1. $10(x^2 + 5)^9 \cdot 2x$

2. $\frac{2x}{x^2 + 5}$

3. $e^{x^2+5} \cdot 2x$

4. $9(\ln(x)+1)^8 \cdot \frac{1}{x}$

5. $7(e^x + 1)^6 \cdot e^x$

6. $7(2^x + 1)^6 \cdot 2^x \ln(2)$

7. $e^{2x+7} \cdot 2$

8. $\frac{1}{e^{2x} + 7} \cdot e^{2x} \cdot 2$

9. $\frac{1}{2}(x^5 + 19)^{-1/2} \cdot 5x^4$

10. $XXX - 10(e^x - 7)^{-2} e^x XXX$

11. $9(\ln(2^x + 1))^8 \cdot \frac{1}{2^x + 1} \cdot 2^x \ln(2)$

12. $9(\log(2^x + 1))^8 \cdot \frac{1}{\ln(10)(2^x + 1)} \cdot 2^x \ln(2)$

13. $e^{(\ln(x)+1)^5} \cdot 5(\ln(x)+1)^4 \cdot \frac{1}{x}$

14. e^{5x-5}

15. $12(7e^{3x} - 1)^{117} e^{3x} \cdot 3$

16. $17(5x + 1)^{16} \cdot 5$

17. $17(5x^2 + 1)^{16} \cdot 10x$

18. $7 \frac{1}{x^9 + 1} \cdot 9x^8$

19. $5 \frac{1}{\ln(10)(e^{3x} + 7)} \cdot e^{3x} \cdot 3$

20. $\sqrt{11} \cdot e^{(3x^2)} 6x$

21. $15\sqrt{7}x^4 - 6.3x^2 + 3.6x^{2.6} + 2.6x^{-2.3}$

22. $e^{(7x^3+2x+3)} (21x^2 + 2)$

23. $e^{(\ln(x)+32)^7} \cdot 7(\ln(x)+32)^6 \cdot \frac{1}{x}$

24. $7 \cdot 53(2x^5 + \pi)^{52} 10x^4$

25. $12 \cdot 9(e^{7x} + 1)^8 e^{7x} \cdot 7$

26. $50(\ln(x+1)+8)^9 \cdot \frac{1}{x+1}$

27. $35(x + 8e^{2x})^4 (1 + 8e^{2x} \cdot 2)$

28. $7 \frac{1}{3x^2 + x - \pi} (6x + 1)$

29. $2 \frac{1}{e^{3x} + 1.6} e^{3x} 3$

30. $3 \cdot \frac{1}{\ln(x)+1} \cdot \frac{1}{x}$

31. $2e^{5x-5}$

32. $3e^{2x^5+1} \cdot 10x^4$

33. $5 \cdot 2^{x^4+1} \ln(2) \cdot 4x^3$

34. $9e^{\ln(x)+53} \frac{1}{x}$

35. $10e^{(e^x)} e^x$

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36. $\frac{1}{(e^x + 1)^5 + 2} 5(e^x + 1)^4 e^x$

37. $5(\ln(e^x + 7) + 2)^4 \frac{1}{e^x + 7} e^x$

38. $7(e^{\ln(x)+53})^6 e^{\ln(x)+53} \frac{1}{x}$

39. $\frac{1}{e^{3x^2+2x-9} + 1} e^{3x^2+2x-9} (6x+2)$

40. $\frac{1}{\ln(2)(e^x + 1)} \cdot e^x$

41. $10(x^2 + 5)^9 2x$

42. $7(2^x + 1)^6 2^x \ln(2)$

43. $10(x^3 + 5)^9 3x^2$

44. $6(2^x + 1)^5 2^x \ln(2)$

45. $-2(4x^2 + 5x + 3)^{-3} (8x + 5)$

46. $f(x) = (x^{1/2} - 2x)^4$

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

47. $10x e^{5x^2}$

48. $8(x^3 + 1)^7 \cdot 3x^2$

49. $10(x^2 + 5)^9 \cdot 2x$

50. $10(x^3 + 5)^9 \cdot 3x$

51. $10(x^2 + 5)^9 \cdot 2x$

52. $7(1.3^x + 5)^6 \cdot \ln(1.3) \cdot 1.3^x$

53. $7(3x^4 + 5)^6 12x^3$

54. $e^{(3x^5)} 15x^4$

55. $\ln(10) 10^{(3x^5)} 15x^4$

56. $9(3e^x + 7)^8 3e^x$

57. $3(5\ln(x) + 7)^2 5 \frac{1}{x}$

58. $\frac{1}{3x^7 + 1} 21x^6$

59. $\frac{1}{e^{(x^2)} + 1} \cdot e^{(x^2)} \cdot 2x$

60. $\frac{1}{(3x+1)^5 + 1} \cdot 5(3x+1)^4 \cdot 3$

61. $\frac{1}{(x+1)^5 + 7} \cdot 5(x+1)^4$