

DERIVATIVES (Chain Rule and Product Rule)

Remember the following:

- when you simplify radicals work with fractional exponents
- when you move an expression from the denominator to the numerator the sign on the exponent changes from a positive to a negative.
- when you subtract one from a negative exponent the exponent gets smaller (larger negative value) ex: $x^{-3} \Rightarrow x^{-3-1} \Rightarrow x^{-4}$
- when removing a common factor from an expression always look for the smallest common exponent

$$\text{ex: } x^{\frac{2}{3}} + 5x^{\frac{1}{3}} \Rightarrow x^{\frac{1}{3}} \left(x^{\frac{1}{3}} + 5 \right)$$

$$x^{-\frac{5}{8}} + x^{-\frac{3}{8}} + x \Rightarrow x^{-\frac{5}{8}} \left(1 + x^{\frac{2}{8}} + x^{\frac{13}{8}} \right)$$

1. $x^2 + 4x - 6$

2. $x^3 - 5x^2 + 4x + 11$

3. $(x^6 - x^4 + 2x)$

4. $(x^{12} + x^7 - x^3 + 2)$

5. $(x + 1)^2$

6. $(x - 5)^4$

7. $(4x + 2)^5$

8. $(9x + 5)^7$

9. $(7x + 3)^{\frac{1}{2}}$

10. $(x^2 + 3x)^{\frac{5}{3}}$

11. $(7x^3 + 6x - 5)^{-\frac{3}{7}}$

12. $\sqrt{x^3 + 5x}$

13. $\sqrt[3]{5x^3 + 7x - 4}$

14. $\sqrt[5]{(5x - 3)^4}$

15. $\sqrt[7]{(4x^2 - 5x + 1)^2}$

16. $\sqrt[3]{(x^2 + 3)^6}$

17. $(4x^3 + 3)^2$

18. $(5x^3 - 2x^2 + 3x)^{-3}$

19. $(2x^2 + x - 1)^{-2}$

20. $(4x^4 - 3x^2 + 5)^{-6}$

21. $x^{-3} + 2x^{-4} - 3x^{-1}$

22. $x^{-7} + 5x^{-3} - 9x$

23. $\frac{1}{(x-3)}$

24. $\frac{5}{(2x-7)}$

25. $\frac{9}{(4x-2)^3}$

26. $\frac{9}{(4x^3 - 7x)^2}$

27. $\frac{5}{\sqrt{4x-6}}$

29. $\frac{9}{\sqrt[5]{(4x-5)^3}}$

31. $(2x-7)(4x+6)$

33. $(4x-5)^2(5x+3)^3$

35. $(5x^2+5)^5(3x^2-1)^6$

37. $(4x^2+3)^{-2}(x^3+1)^4$

39. $\ln 5x^3$

41. $\ln(6x)^2$

43. $\ln x^2(5x+2)^3$

45. $\ln(3x^4+2x^2-5)^3$

47. $5^{(3x^2+2x-5)}$

49. $4^{(5x^2-2x+1)^3}$

51. $5^{(2x+3)} \ln(2x+3)$

53. $(3x+2)^2(5x-1)^3(x+6)^2$

55. $\frac{(5x^3+2x-5)^4}{(4x^2+3)^2}$

57. $\frac{3^{x^3+2x}}{e^{\ln x}}$

59. $\frac{\log_4(x^2+5x-1)}{\ln^2(x^3-5)}$

28. $\frac{7}{\sqrt[4]{3x^2-7x+1}}$

30. $(2x+3)(4x-5)$

32. $(5x^2+3x-2)(4x^4+2x^2+1)$

34. $(5x+2)^3(7x-5)^4$

36. $(3x^4-6)^3(5x+4)^{-3}$

38. $\ln(4x^7)$

40. $(\ln 6x)^2$

42. $(2x+1)\ln x$

44. $\ln[(4x-2)^2(5x+2)^3]$

46. 4^{3x+2}

48. $6^{(4x+5)^2(6x-1)}$

50. $e^{(6x^3-5x)}$

52. $\ln(5x-3)^2 e^{(3x-5)}$

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

46. $\frac{\ln(5x-2)^3}{5^{5x-1}}$

58. $\frac{e^{(4x^2-7x)}}{\sqrt[4]{6x^3-7x+1}}$

60. $\log_7(4x-3)^5 \sqrt[3]{\ln(x^3-5)}$