

Instructions: Use the product rule to find the derivative of each of the following functions with respect to x .

1. $(\sqrt[4]{x})(\sqrt[4]{x})$
2. $(\sqrt{x})(-x-1)$
3. $(3e^x)(\sqrt{x})$
4. $\left(\frac{1}{\sqrt[14]{x}}\right)\left(\frac{1}{\sqrt[12]{x}}\right)$
5. $(3e^x)(-6x^2+4x-3)$
6. $(2x^3-10x^2-4x+6)(7e^x)$
7. $\left(\frac{1}{\sqrt{x}}\right)(\sqrt{x})$
8. $(3x)(\sqrt[4]{x})$
9. $(-7x^2)(\sqrt[14]{x})$
10. $(\sqrt{x})(\sqrt[14]{x})$
11. $\left(\sqrt[24]{x^{23}}\right)(-x-1)$
12. $(e^x)(-6x^2+4x-3)$
13. $(\sqrt[4]{x})(-6x^2)$
14. $(2x^3-10x^2-4x+6)(\sqrt{x})$
15. $\left(\frac{1}{\sqrt{x}}\right)\left(\frac{1}{\sqrt[12]{x}}\right)$
16. $(e^x)(-6x^2)$
17. $(3x)\left(\frac{1}{\sqrt[12]{x}}\right)$
18. $(\sqrt[6]{x})\left(\frac{1}{\sqrt{x}}\right)$
19. $\left(\frac{1}{\sqrt{x}}\right)(-x-1)$
20. $\left(\sqrt[24]{x^{23}}\right)(x^{2009}+1)$
21. $(\sqrt{x})(e^x)$
22. $(3e^x)(x^{2009}+1)$
23. $(x^{2009}+1)(x^{2009}+1)$
24. $\left(\frac{1}{\sqrt{x}}\right)\left(\frac{1}{\sqrt{x}}\right)$
25. $(\sqrt[4]{x})(7e^x)$
26. $(x^{2009}+1)\left(\frac{1}{\sqrt{x}}\right)$
27. $\left(\sqrt[24]{x^{23}}\right)(\sqrt[4]{x})$
28. $\left(\sqrt[24]{x^{23}}\right)\left(\frac{1}{\sqrt[12]{x}}\right)$
29. $(2x^3-10x^2-4x+6)\left(\frac{1}{\sqrt{x}}\right)$
30. $(-3x^2-6x-4)(\sqrt{x})$
31. $(-x-7)\left(\frac{1}{\sqrt{x}}\right)$
32. $(\sqrt[6]{x})(-x-1)$
33. $(3x)(\sqrt[14]{x})$
34. $(3e^x)\left(\frac{1}{\sqrt[12]{x}}\right)$
35. $(3e^x)(-2x^3-3x^2-7x-9)$
36. $\left(\sqrt[24]{x^{23}}\right)(\sqrt[14]{x})$
37. $\left(\frac{1}{\sqrt{x}}\right)\left(\sqrt[24]{x^{23}}\right)$
38. $(3e^x)\left(\frac{1}{\sqrt{x}}\right)$
39. $(-x-7)(-2x^3-3x^2-7x-9)$
40. $(-x-7)(-6x^2+4x-3)$
41. $(\sqrt{x})(-2x^3-3x^2-7x-9)$
42. $(e^x)(-2x^3-3x^2-7x-9)$
43. $(-x-7)(\sqrt[4]{x})$
44. $(x^{2009}+1)(-6x^2+4x-3)$
45. $(2x^3-10x^2-4x+6)\left(\sqrt[24]{x^{23}}\right)$
46. $(\sqrt[6]{x})(7e^x)$
47. $(\sqrt{x})(-6x^2+4x-3)$
48. $\left(\frac{1}{\sqrt[14]{x}}\right)(\sqrt[4]{x})$
49. $(-3x^2-6x-4)(e^x)$
50. $(-x-7)(\sqrt[14]{x})$

Solutions:

1. $(\sqrt[4]{x})(\frac{1}{4}x^{-3/4}) + (\frac{1}{4}x^{-3/4})(\sqrt[4]{x})$
2. $(\sqrt{x})(-1) + (\frac{1}{2}x^{-1/2})(-x - 1)$
3. $(3e^x)(\frac{1}{2}x^{-1/2}) + (3e^x)(\sqrt{x})$
4. $(\frac{1}{\sqrt[14]{x}})(\frac{-1}{12}x^{-13/12}) + (\frac{-1}{14}x^{-15/14})(\frac{1}{\sqrt[12]{x}})$
5. $(3e^x)(-12x + 4) + (3e^x)(-6x^2 + 4x - 3)$
6. $(2x^3 - 10x^2 - 4x + 6)(7e^x) + (6x^2 - 20x - 4)(7e^x)$
7. $(\frac{1}{\sqrt{x}})(\frac{1}{2}x^{-1/2}) + (\frac{-1}{2}x^{-3/2})(\sqrt{x})$
8. $(3x)(\frac{1}{4}x^{-3/4}) + (3)(\sqrt[4]{x})$
9. $(-7x^2)(\frac{1}{14}x^{-13/14}) + (-14x)(\sqrt[14]{x})$
10. $(\sqrt{x})(\frac{1}{14}x^{-13/14}) + (\frac{1}{2}x^{-1/2})(\sqrt[14]{x})$
11. $(\sqrt[24]{x^{23}})(-1) + (\frac{23}{24}x^{-1/24})(-x - 1)$
12. $(e^x)(-12x + 4) + (e^x)(-6x^2 + 4x - 3)$
13. $(\sqrt[4]{x})(-12x) + (\frac{1}{4}x^{-3/4})(-6x^2)$
14. $(2x^3 - 10x^2 - 4x + 6)(\frac{1}{2}x^{-1/2}) + (6x^2 - 20x - 4)(\sqrt{x})$
15. $(\frac{1}{\sqrt{x}})(\frac{-1}{12}x^{-13/12}) + (\frac{-1}{2}x^{-3/2})(\frac{1}{\sqrt[12]{x}})$
16. $(e^x)(-12x) + (e^x)(-6x^2)$
17. $(3x)(\frac{-1}{12}x^{-13/12}) + (3)(\frac{1}{\sqrt[12]{x}})$
18. $(\sqrt[6]{x})(\frac{-1}{2}x^{-3/2}) + (\frac{1}{6}x^{-5/6})(\frac{1}{\sqrt{x}})$
19. $(\frac{1}{\sqrt{x}})(-1) + (\frac{-1}{2}x^{-3/2})(-x - 1)$
20. $(\sqrt[24]{x^{23}})(2009x^{2008}) + (\frac{23}{24}x^{-1/24})(x^{2009} + 1)$
21. $(\sqrt{x})(e^x) + (\frac{1}{2}x^{-1/2})(e^x)$
22. $(3e^x)(2009x^{2008}) + (3e^x)(x^{2009} + 1)$
23. $(x^{2009} + 1)(2009x^{2008}) + (2009x^{2008})(x^{2009} + 1)$
24. $(\frac{1}{\sqrt{x}})(\frac{-1}{2}x^{-3/2}) + (\frac{-1}{2}x^{-3/2})(\frac{1}{\sqrt{x}})$
25. $(\sqrt[4]{x})(7e^x) + (\frac{1}{4}x^{-3/4})(7e^x)$
26. $(x^{2009} + 1)(\frac{-1}{2}x^{-3/2}) + (2009x^{2008})(\frac{1}{\sqrt{x}})$
27. $(\sqrt[24]{x^{23}})(\frac{1}{4}x^{-3/4}) + (\frac{23}{24}x^{-1/24})(\sqrt[4]{x})$
28. $(\sqrt[24]{x^{23}})(\frac{-1}{12}x^{-13/12}) + (\frac{23}{24}x^{-1/24})(\frac{1}{\sqrt[12]{x}})$
29. $(2x^3 - 10x^2 - 4x + 6)(\frac{-1}{2}x^{-3/2}) + (6x^2 - 20x - 4)(\frac{1}{\sqrt{x}})$
30. $(-3x^2 - 6x - 4)(\frac{1}{2}x^{-1/2}) + (-6x - 6)(\sqrt{x})$
31. $(-x - 7)(\frac{-1}{2}x^{-3/2}) + (-1)(\frac{1}{\sqrt{x}})$
32. $(\sqrt[6]{x})(-1) + (\frac{1}{6}x^{-5/6})(-x - 1)$
33. $(3x)(\frac{1}{14}x^{-13/14}) + (3)(\sqrt[14]{x})$
34. $(3e^x)(\frac{-1}{12}x^{-13/12}) + (3e^x)(\frac{1}{\sqrt[12]{x}})$
35. $(3e^x)(-6x^2 - 6x - 7) + (3e^x)(-2x^3 - 3x^2 - 7x - 9)$
36. $(\sqrt[24]{x^{23}})(\frac{1}{14}x^{-13/14}) + (\frac{23}{24}x^{-1/24})(\sqrt[14]{x})$
37. $(\frac{1}{\sqrt{x}})(\frac{23}{24}x^{-1/24}) + (\frac{-1}{2}x^{-3/2})(\sqrt[24]{x^{23}})$
38. $(3e^x)(\frac{-1}{2}x^{-3/2}) + (3e^x)(\frac{1}{\sqrt{x}})$
39. $(-x - 7)(-6x^2 - 6x - 7) + (-1)(-2x^3 - 3x^2 - 7x - 9)$
40. $(-x - 7)(-12x + 4) + (-1)(-6x^2 + 4x - 3)$
41. $(\sqrt{x})(-6x^2 - 6x - 7) + (\frac{1}{2}x^{-1/2})(-2x^3 - 3x^2 - 7x - 9)$
42. $(e^x)(-6x^2 - 6x - 7) + (e^x)(-2x^3 - 3x^2 - 7x - 9)$
43. $(-x - 7)(\frac{1}{4}x^{-3/4}) + (-1)(\sqrt[4]{x})$
44. $(x^{2009} + 1)(-12x + 4) + (2009x^{2008})(-6x^2 + 4x - 3)$
45. $(2x^3 - 10x^2 - 4x + 6)(\frac{23}{24}x^{-1/24}) + (6x^2 - 20x - 4)(\sqrt[24]{x^{23}})$
46. $(\sqrt[6]{x})(7e^x) + (\frac{1}{6}x^{-5/6})(7e^x)$
47. $(\sqrt{x})(-12x + 4) + (\frac{1}{2}x^{-1/2})(-6x^2 + 4x - 3)$
48. $(\frac{1}{\sqrt[14]{x}})(\frac{1}{4}x^{-3/4}) + (\frac{-1}{14}x^{-15/14})(\sqrt[4]{x})$
49. $(-3x^2 - 6x - 4)(e^x) + (-6x - 6)(e^x)$
50. $(-x - 7)(\frac{1}{14}x^{-13/14}) + (-1)(\sqrt[14]{x})$