

Find the derivative of each of the following functions by using the chain rule.

1. $(\csc(x))^{20}$
2. $(9x + 3)^{20}$
3. $-\cos(\sqrt{9x})$
4. $\frac{1}{-10x^2+10x+2}$
5. $-\sin(9x^3 + 21)$
6. $\sin(\sin(x))$
7. $-\sin(-\sin(x))$
8. $\cot(-8x)$
9. $\cos(\sec(x))$
10. $\sqrt[11]{-\cos(x)}$
11. $\cos(9x^2 + 14x + 6)$
12. $\sqrt[16]{9x^3 + 21}$
13. $(\cos(x))^{2008}$
14. $(\csc(x))^{2008}$
15. $\frac{1}{e^{2x}}$
16. $\sqrt{e^{8x}}$
17. $(\sin(x))^{2008}$
18. $-\sin(5x^3 + 11)$
19. $\cos(\cot(x))$
20. $\sin(\cot(x))$
21. 2^{-5x+2}
22. $\sqrt[16]{-\cos(x)}$
23. $\sin(e^{2x})$
24. $-\sin(\sec(x))$
25. $-\cos(\cos(x))$
26. $e^{15 \csc(5x)}$
27. $(12x + 5)^{17}$
28. $(\tan(x))^{20}$
29. $\tan(\sec(x))$
30. e^{-9x}
31. 2^{6x^3+8}
32. $-\cos(\sqrt{8x})$
33. $-\cos(e^x)$
34. $\cot(\sin(x))$
35. $\cot(8 \csc(8x))$
36. $2^{\sqrt{x}}$
37. $\frac{1}{-8x}$
38. $\sqrt[9]{\csc(x)}$
39. $\sqrt[16]{\sec(x)}$
40. $\sqrt[11]{\sec(x)}$
41. $-\sin(9x^2 + 14x + 6)$
42. $\sqrt[16]{-\sin(x)}$
43. $\tan(\cos(x))$
44. $(\sin(x))^{17}$
45. $\sqrt[15]{\csc(x)}$
46. $\sqrt[9]{-\sin(x)}$
47. $\tan(\sqrt{x})$
48. $\sqrt[15]{-\cos(x)}$
49. $2^{\sqrt{9x}}$
50. $\sqrt{6x^3 + 8}$
51. $2^{\sin(x)}$
52. $\sqrt[9]{9x^2 + 14x + 6}$
53. $\sqrt[3]{\sec(x)}$
54. $(\tan(x))^{100}$
55. $\sqrt[12]{\csc(x)}$
56. e^{5x^3+11}
57. $\sqrt[3]{9x^2 + 14x + 6}$
58. $\cot(\csc(x))$
59. $(\cot(x))^{2008}$
60. $\frac{1}{9x^2+14x+6}$

Solutions:

1. $20 (\csc(x))^{19} (-\csc(x) \cot(x))$
2. $20 (9x + 3)^{19} (9)$
3. $\sin(\sqrt{9x}) \left(\frac{1}{2\sqrt{9x}} (9)\right)$
4. $\left(\frac{-1}{-10x^2+10x+2^2}\right) (-20x + 10)$
5. $-\cos(9x^3 + 21) (27x^2)$
6. $\cos(\sin(x)) (\cos(x))$
7. $-\cos(-\sin(x)) (-\cos(x))$
8. $-\csc^2(-8x) (-8)$
9. $-\sin(\sec(x)) (\sec(x) \tan(x))$
10. $\left(\frac{1}{11 \sqrt[11]{(-\cos(x))^{10}}}\right) (\sin(x))$
11. $-\sin(9x^2 + 14x + 6) (18x + 14)$
12. $\left(\frac{1}{16 \sqrt[16]{(9x^3+21)^{15}}}\right) (27x^2)$
13. $2008 (\cos(x))^{2007} (-\sin(x))$
14. $2008 (\csc(x))^{2007} (-\csc(x) \cot(x))$
15. $\left(\frac{-1}{e^{2x^2}}\right) (e^{2x} (2))$
16. $\left(\frac{1}{2\sqrt{e^{8x}}}\right) (e^{8x} (8))$
17. $2008 (\sin(x))^{2007} (\cos(x))$
18. $-\cos(5x^3 + 11) (15x^2)$
19. $-\sin(\cot(x)) (-\csc^2(x))$
20. $\cos(\cot(x)) (-\csc^2(x))$
21. $2^{-5x+2} (\ln 2) (-5)$
22. $\left(\frac{1}{16 \sqrt[16]{(-\cos(x))^{15}}}\right) (\sin(x))$
23. $\cos(e^{2x}) (e^{2x} (2))$
24. $-\cos(\sec(x)) (\sec(x) \tan(x))$
25. $\sin(\cos(x)) (-\sin(x))$
26. $e^{15 \csc(5x)} (-15 \csc(5x) \cot(5x) (5))$
27. $17 (12x + 5)^{16} (12)$
28. $20 (\tan(x))^{19} (\sec^2(x))$
29. $\sec^2(\sec(x)) (\sec(x) \tan(x))$
30. $e^{-9x} (-9)$
31. $2^{6x^3+8} (\ln 2) (18x^2)$
32. $\sin(\sqrt{8x}) \left(\frac{1}{2\sqrt{8x}} (8)\right)$
33. $\sin(e^x) (e^x)$
34. $-\csc^2(\sin(x)) (\cos(x))$
35. $-\csc^2(8 \csc(8x)) (-8 \csc(8x) \cot(8x) (8))$
36. $2^{\sqrt{x}} (\ln 2) \left(\frac{1}{2\sqrt{x}}\right)$
37. $\left(\frac{-1}{-8x^2}\right) (-8)$
38. $\left(\frac{1}{9 \sqrt[9]{(\csc(x))^8}}\right) (-\csc(x) \cot(x))$
39. $\left(\frac{1}{16 \sqrt[16]{(\sec(x))^{15}}}\right) (\sec(x) \tan(x))$
40. $\left(\frac{1}{11 \sqrt[11]{(\sec(x))^{10}}}\right) (\sec(x) \tan(x))$
41. $-\cos(9x^2 + 14x + 6) (18x + 14)$
42. $\left(\frac{1}{16 \sqrt[16]{(-\sin(x))^{15}}}\right) (-\cos(x))$
43. $\sec^2(\cos(x)) (-\sin(x))$
44. $17 (\sin(x))^{16} (\cos(x))$
45. $\left(\frac{1}{15 \sqrt[15]{(\csc(x))^{14}}}\right) (-\csc(x) \cot(x))$
46. $\left(\frac{1}{9 \sqrt[9]{(-\sin(x))^8}}\right) (-\cos(x))$
47. $\sec^2(\sqrt{x}) \left(\frac{1}{2\sqrt{x}}\right)$
48. $\left(\frac{1}{15 \sqrt[15]{(-\cos(x))^{14}}}\right) (\sin(x))$
49. $2^{\sqrt{9x}} (\ln 2) \left(\frac{1}{2\sqrt{9x}} (9)\right)$
50. $\left(\frac{1}{2\sqrt{6x^3+8}}\right) (18x^2)$
51. $2^{\sin(x)} (\ln 2) (\cos(x))$
52. $\left(\frac{1}{9 \sqrt[9]{(9x^2+14x+6)^8}}\right) (18x + 14)$
53. $\left(\frac{1}{3 \sqrt[3]{(\sec(x))^2}}\right) (\sec(x) \tan(x))$
54. $100 (\tan(x))^{99} (\sec^2(x))$
55. $\left(\frac{1}{12 \sqrt[12]{(\csc(x))^{11}}}\right) (-\csc(x) \cot(x))$
56. $e^{5x^3+11} (15x^2)$
57. $\left(\frac{1}{3 \sqrt[3]{(9x^2+14x+6)^2}}\right) (18x + 14)$
58. $-\csc^2(\csc(x)) (-\csc(x) \cot(x))$
59. $2008 (\cot(x))^{2007} (-\csc^2(x))$
60. $\left(\frac{-1}{9x^2+14x+6^2}\right) (18x + 14)$