

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

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

Solutions:

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