

Answers to "Derivative Practice #2"

Many of these answers can be simplified further, but these are the results you should have after applying the various differentiation rules.

1.  $x \cdot \cos(x) + \sin(x)$
2.  $-x \cdot \sin(x) + \cos(x)$
3.  $x^2 \cdot \cos(x) + 2x \cdot \sin(x)$
4.  $x^3 \cdot \cos(x) + 3x^2 \cdot \sin(x)$
5.  $-x^3 \cdot \sin(x) + 3x^2 \cdot \cos(x)$
6.  $-\sin(x) \cdot \sin(x) + \cos(x) \cdot \cos(x)$   
 $= -\sin^2 x + \cos^2 x$
7.  $(x^2+3) \cdot \cos(x) + (2x) \cdot \sin(x)$
8.  $-\sqrt{x} \cdot \sin(x) + \frac{1}{2\sqrt{x}} \cdot \cos(x)$
9.  $\frac{1}{x} \cdot \cos(x) - \frac{1}{x^2} \cdot \sin(x)$
10.  $x \cdot e^x + e^x$
11.  $x^3 \cdot \frac{1}{x} + 3x^2 \cdot \ln(x)$
12.  $\frac{1}{x} \cdot e^x - \frac{1}{x^2} \cdot e^x$
13.  $\sin(x) \cdot \cos(x) + \cos(x) \cdot \sin(x) = 2 \cdot \sin(x) \cdot \cos(x)$
14.  $-\cos(x) \cdot \sin(x) - \sin(x) \cdot \cos(x) = -2 \cdot \sin(x) \cdot \cos(x)$
15.  $e^x \cdot e^x + e^x \cdot e^x = 2 \cdot e^{2x}$
16.  $\sqrt{x} \cdot (3x^2) + \frac{1}{2\sqrt{x}} \cdot (x^3 - 5)$
17.  $\frac{x \cdot \cos(x) - \sin(x)}{x^2}$
18.  $\frac{x^3 \cdot \cos(x) - 3x^2 \cdot \sin(x)}{x^6}$
19.  $\frac{-x^2 \cdot \sin(x) - 2x \cdot \cos(x)}{x^4}$
20.  $\frac{(x-2) \cdot (2x) - (x^2 + 3)}{(x-2)^2}$
21.  $\frac{(x-3) - (x+5)}{(x-3)^2}$
22.  $\frac{\cos(x) \cdot \cos(x) + \sin(x) \cdot \sin(x)}{(\cos(x))^2} = \frac{1}{\cos^2(x)} = \sec^2(x)$
23.  $\frac{\sqrt{x} - \frac{1}{2\sqrt{x}} \cdot (x+7)}{x \tan x \sec x}$
24.  $\frac{(x+2) - (x-8)}{(x+2)^2}$
25.  $\frac{x \cdot \cos(x) - (1 + \sin(x))}{x^2}$
26.  $\frac{-\sin(x) \cdot \sin(x) - \cos(x) \cdot \cos(x)}{(\sin(x))^2} = \frac{-1}{\sin^2(x)} = -\csc^2(x)$
27.  $\frac{(2 + \sin(x)) - x \cdot \cos(x)}{(2 + \sin(x))^2}$
28.  $\frac{\sqrt{x} \cdot (-\sin(x)) - \frac{1}{2\sqrt{x}} (2 + \cos(x))}{x}$
29.  $\frac{x \cdot e^x - e^x}{x^2}$
30.  $\frac{(x+1) \cdot \frac{1}{x} - \ln(x)}{(x+1)^2}$
31.  $\frac{\sin(x) \cdot \frac{1}{2\sqrt{x}} - \sqrt{x} \cdot \cos(x)}{(\sin(x))^2}$
32.  $\frac{(x+5) \cdot (2x+3) - (x^2+3x-2)}{(x+5)^2}$
33.  $\cos(5x+2) \cdot 5$
34.  $5\sin^4(x^2+3) \cdot \cos(x^2+3) \cdot (2x)$
35.  $\cos(\sqrt{x}) \cdot \frac{1}{2\sqrt{x}}$
36.  $\cos\left(\frac{1}{x}\right) \cdot \left(-\frac{1}{x^2}\right)$

37.  $-4\cos^3(3x-1)\cdot\sin(3x-1)\cdot 3$  38.  $-\sin(x^3+7x)\cdot(3x^2+7)$  39.  $-\sin(\sqrt{x})\cdot(\frac{1}{2\sqrt{x}})$
40.  $7\cos^6(e^x)\cdot(-\sin(e^x))\cdot e^x$  41.  $\sec^2(x^3)\cdot(3x^2)$  42.  $\cos(e^x)\cdot e^x$
43.  $\cos(\cos(x))\cdot(-\sin(x))$  44.  $-\sin(\frac{1}{x^2})\cdot(-\frac{2}{x^3})$  45.  $e^{(5x+4)}\cdot(5)$
46.  $e^{\sin(x)}\cdot\cos(x)$  47.  $e^{(7x-1)}\cdot(7)$  48.  $e^{1/x}\cdot(-\frac{1}{x^2})$
49.  $e^{\tan(x)}\cdot\sec^2(x)$  50.  $e^{(x^2)}\cdot(2x)$  51.  $\frac{1}{3x+7}\cdot(3) = \frac{3}{3x+7}$
52.  $\frac{1}{x^2+3}\cdot(2x) = \frac{2x}{x^2+3}$  53.  $\frac{1}{\sin(x)}\cdot\cos(x) = \frac{\cos(x)}{\sin(x)} = \cot(x)$
54.  $\frac{1}{2+\sqrt{x}}\cdot\frac{1}{2\sqrt{x}}$  55.  $\frac{1}{\tan(x)}\cdot\sec^2(x)$  56.  $\frac{1}{1+x^2}\cdot(2x) = \frac{2x}{1+x^2}$
57.  $\frac{1}{7-\cos(x)}\cdot(\sin(x)) = \frac{\sin(x)}{7-\cos(x)}$  58.  $3\cdot(5x+3)^2\cdot(5) = 15\cdot(5x+3)^2$
59.  $5\cdot(4x-1)^4\cdot(4) = 20\cdot(4x-1)^4$  60.  $10\cdot(3x+2)^9\cdot(3) = 30\cdot(3x+2)^9$
61.  $7\cdot(x^2+3)^6\cdot(2x) = 14x\cdot(x^2+3)^6$  62.  $5\cdot(e^x+x)^4\cdot(e^x+1)$
63.  $5\cdot(2+\sin(x))^4\cdot(\cos(x))$  64.  $8\cdot(e^x+\cos(x))^7\cdot(e^x-\sin(x))$
65.  $5\cdot(\sin(x)+\cos(x))^4\cdot(\cos(x)-\sin(x))$
66.  $\frac{1}{2}(2+\sin(x))^{-1/2}\cdot(\cos(x)) = \frac{\cos(x)}{2\sqrt{2+\sin(x)}}$  67.  $\frac{1}{2}(x^2+5)^{-1/2}\cdot(2x) = \frac{x}{\sqrt{x^2+5}}$
68.  $\frac{1}{2}(x^5+3x)^{-1/2}\cdot(5x^4+3) = \frac{5x^4+3}{2\sqrt{x^5+3x}}$  69.  $\frac{1}{2}(10-x^2)^{-1/2}\cdot(-2x) = \frac{-x}{\sqrt{10-x^2}}$
70.  $-\frac{1}{2}(x^3+5)^{-3/2}\cdot(3x^2)$
71.  $\frac{1}{2}(3+\ln(x))^{-1/2}\cdot(\frac{1}{x}) = \frac{1}{2x\sqrt{3+\ln(x)}}$
72.  $\frac{1}{2}(e^x-\sin(x))^{-1/2}\cdot(e^x-\cos(x)) = \frac{e^x-\cos(x)}{2\sqrt{e^x-\sin(x)}}$