

## 6 Math101 answers

6.1 The answers are:

$$f_1'(x) = \frac{x}{\sqrt{x^2+1}}, \quad f_2'(x) = \frac{1}{(2x+1)^2}, \quad f_3'(x) = \sin(x) + x \cos(x).$$

6.2 The answers are:

$$\begin{aligned} f_1'(x) &= (x+1)e^x, & f_2'(x) &= 4x \cos(x) - 2x^2 \sin(x), \\ f_3'(x) &= \left(\frac{1}{x} + \ln(x)\right)e^x, & f_4'(x) &= \cos^2(x) - \sin^2(x). \end{aligned}$$

6.3 The answers are:

$$f_1'(x) = \frac{-1}{(x-1)^2}, \quad f_2'(x) = \frac{3x^2+4x-5}{(3x+2)^2}, \quad f_3'(x) = \frac{-1}{(x-2)^2}.$$

6.4 The answers are:

$$f_1'(x) = 4(3x-1)^{\frac{1}{3}}, \quad f_2'(x) = \frac{2x+3}{x^2+3x}, \quad f_3'(x) = -e^{2-x}, \quad f_4'(x) = 3x^2 \cos(x^3).$$

6.5 The answer is  $f'(x) = xe^x$ .

6.6 The answer is  $f'(x) = \ln(x)$ .

6.7 The answers are:

$$\begin{aligned} f_1'(x) &= 3x^2 e^{x^3}, & f_2'(x) &= -2 \cos(x) \sin(x), \\ f_3'(x) &= 3 \sin^2(x) \cos(x) & f_4'(x) &= 4x(1 + \tan^2(x^2)). \end{aligned}$$

6.8 We have that

$$\frac{d}{dx} \frac{\sin(x)}{\cos(x)} = \frac{\cos^2(x) + \sin^2(x)}{\cos^2(x)} = 1 + \tan^2(x).$$

6.9 The answer is  $f'(x) = \frac{(x+1)e^x \cos(x) - xe^x \sin(x)}{\cos^2(x)}$ .

6.10 The answers are:

$$f'(x) = -2 \cos(\sqrt{x^2+1}) \sin(\sqrt{x^2+1}) \frac{x}{\sqrt{x^2+1}}.$$

6.11 The answers are:

$$\begin{aligned}f_1'(x) &= \frac{2 \cos(x) \sin^2(x) - \cos^3(x)}{\sin^2(x)}, & f_2'(x) &= \frac{(2x^2 - 1)e^{x^2}}{x^2}, \\f_3'(x) &= \frac{(1 - x) \cos(x) - x \sin(x)}{e^x}\end{aligned}$$

6.12 The answers are:

$$\begin{aligned}f(x) &= \frac{-(x+1)\ln(x) + 1}{\ln^2(x)}e^x, \\g(x) &= e^x((1+x)\ln(x) + 1), \\h(x) &= xe^x((2+x)\sin(x) + x\cos(x))\end{aligned}$$