

Key

1. $y = \sin(\cos(x^2))$

$$y' = \cos(\cos(x^2))(-\sin(x^2))(2x)$$

2. $y = e^{x^3+4x^2-x+1} + \tan x$

$$y' = e^{x^3+4x^2-x+1}(3x^2 + 8x - 1) + \sec^2 x$$

3. $y = \ln(-3x^{-2} + 4x)$

$$y' = \frac{1}{-3x^{-2}+4x}(6x^{-3} + 4) = \frac{6x^{-3}+4}{-3x^{-2}+4x}$$

4. $y = \sec\left(\frac{x^2-x+1}{\tan x}\right)$

$$y' = \sec\left(\frac{x^2-x+1}{\tan x}\right) \tan\left(\frac{x^2-x+1}{\tan x}\right) \left(\frac{(\tan x)(2x-1)-(x^2-x+1)\sec^2 x}{\tan^2 x}\right)$$

5. $z = e^t + t^e + e^e$ (Find $\frac{dz}{dt}$)

$$\frac{dz}{dt} = e^t + et^{e-1} + 0$$

6. $h = \arctan(e^x)$

$$h' = \frac{1}{1+(e^x)^2} e^x = \frac{e^x}{1+e^{2x}}$$

7. $y = (\sin x)(x^3 - 2x + 5)^{100}$

$$y' = (\cos x)(x^3 - 2x + 5)^{100} + (\sin x)100(x^3 - 2x + 5)^{99}(3x^2 - 2)$$

8. $y = \sqrt{\frac{\csc x+1}{\cot x+1}}$

$$y' = \frac{1}{2} \left(\frac{\csc x+1}{\cot x+1}\right)^{-1/2} \left(\frac{(\cot x+1)(-\csc x \cot x) - (\csc x+1)(-\csc^2 x)}{(\cot x+1)^2}\right)$$

9. $y = x^x$

$$\ln y = x \ln x$$

$$\frac{y'}{y} = \ln x + x\left(\frac{1}{x}\right)$$

$$y' = y(\ln x + 1)$$

$$y' = x^x(\ln x + 1)$$

10. $y = x^4 + 4^x + 4^4 + x^x$

$$y' = 4x^3 + 4^x \ln 4 + x^x(\ln x + 1)$$