

Section 3.6: Additional Problems Solutions

1. $y = 3 \ln(x^2 + 1) + 5 \ln(x + 5)$

$$y' = 3 * \frac{2x}{x^2 + 1} + 5 * \frac{1}{x + 5} = \frac{6x}{x^2 + 1} + \frac{5}{x + 5}$$

2. $y = 2 \ln(x^3 + 1) - 3 \ln(x^4 + 5)$

$$y' = \frac{6x^2}{x^3 + 1} - \frac{12x^3}{x^4 + 5}$$

3. $y = 5 \ln(3x + 5) + \ln(e^{3x^2+5}) - 3 \ln(2x + 1)$

$$y = 5 \ln(3x + 5) + 3x^2 + 5 - 3 \ln(2x + 1)$$

$$y' = \frac{15}{3x + 5} + 6x - \frac{6}{2x + 1}$$

4. $f'(x) = \frac{1}{x} + \frac{2 \ln x}{x} + \frac{3(\ln x)^2}{x}$

5. $y' = \frac{5x^4 \ln(2)}{(x^5 + 7) \ln(10)} * 2^{\log(x^5+7)}$

6. $y' = \frac{1}{\ln(x^2 + 5)} * \frac{2x}{x^2 + 5} = \frac{2x}{(x^2 + 5) \ln(x^2 + 5)}$

7. $f'(x) = \frac{1}{\ln(\ln(x + 2))} * \frac{1}{\ln(x + 2)} * \frac{1}{(x + 2)}$

8. $f'(x) = \frac{4}{3} [\ln(x^2 + 1)]^{\frac{1}{3}} * \left(\frac{2x}{x^2 + 1} \right)$

9. $f'(x) = 4 \left[\frac{\ln(x) + 4}{e^{2x}} \right]^3 \left(\frac{e^{2x} \frac{1}{x} - 2e^{2x}(\ln(x) + 4)}{(e^{2x})^2} \right)$

10. $\ln(y) = \ln \left((3x^5 - 1)^4 (x^3 + 2)^2 \right)$

$$\ln(y) = \ln((3x^5 - 1)^4) + \ln((x^3 + 2)^2)$$

$$\ln(y) = 4 \ln(3x^5 - 1) + 2 \ln(x^3 + 2)$$

$$\frac{y'}{y} = \frac{4 * 15x^4}{3x^5 - 1} + \frac{2 * 3x^2}{x^3 + 2}$$

$$y' = y \left(\frac{60x^4}{3x^5 - 1} + \frac{6x^2}{x^3 + 2} \right)$$

$$y' = (3x^5 - 1)^4 (x^3 + 2)^2 \left(\frac{60x^4}{3x^5 - 1} + \frac{6x^2}{x^3 + 2} \right)$$

11. $\ln(y) = \ln \left(\frac{(x^3 + 5)^5}{(2x^2 + 1)^4} \right)$

$$\ln(y) = \ln(x^3 + 5)^5 - \ln(2x^2 + 1)^4$$

$$\ln(y) = 5 \ln(x^3 + 5) - 4 \ln(2x^2 + 1)$$

$$\frac{y'}{y} = \frac{5 * 3x^2}{x^3 + 5} - \frac{4 * 4x}{2x^2 + 1}$$

$$y' = y \left(\frac{5 * 3x^2}{x^3 + 5} - \frac{4 * 4x}{2x^2 + 1} \right)$$

$$y' = \frac{(x^3 + 5)^5}{(2x^2 + 1)^4} \left(\frac{15x^2}{x^3 + 5} - \frac{16x}{2x^2 + 1} \right)$$

$$12. \ln(y) = \ln\left(e^{(x^4+3x^2+1)}(2x^3+7x)^3\right)$$

$$\ln(y) = \ln\left(e^{(x^4+3x^2+1)}\right) + \ln(2x^3+7x)^3$$

$$\ln(y) = x^4 + 3x^2 + 1 + 3\ln(2x^3+7x)$$

$$\frac{y'}{y} = 4x^3 + 6x + \frac{3 * (6x + 7)}{2x^3 + 7x}$$

$$y' = y\left(4x^3 + 6x + \frac{3 * (6x + 7)}{2x^3 + 7x}\right)$$

$$y' = e^{(x^4+3x^2+1)}(2x^3+7x)^3\left(4x^3 + 6x + \frac{3 * (6x + 7)}{2x^3 + 7x}\right)$$

$$13. \ln(y) = \ln(x^2+1)^{x^3}$$

$$\ln(y) = x^3 \ln(x^2+1)$$

$$\frac{y'}{y} = 3x^2 \ln(x^2+1) + \frac{x^3 * 2x}{x^2+1}$$

$$y' = y\left(3x^2 \ln(x^2+1) + \frac{2x^4}{x^2+1}\right)$$

$$y' = (x^2+1)^{x^3}\left(3x^2 \ln(x^2+1) + \frac{2x^4}{x^2+1}\right)$$

$$14. \ln(y) = \ln(x^4+3x)^{\tan(5x+4)}$$

$$\ln(y) = \tan(5x+4) \ln(x^4+3x)$$

$$\frac{y'}{y} = 5 \sec^2(5x+4) \ln(x^4+3x) + \tan(5x+4) * \frac{4x^3+3}{x^4+3x}$$

$$y' = (x^4+3x)^{\tan(5x+4)}\left(5 \sec^2(5x+4) \ln(x^4+3x) + \tan(5x+4) * \frac{4x^3+3}{x^4+3x}\right)$$