

# Lesson 5 Homework

$$x^{\frac{1}{3}} = \frac{1}{3} x^{-\frac{1}{3}} = \frac{1}{3\sqrt[3]{x}}$$

$$\textcircled{1} \quad y = \frac{1}{x} + \frac{2}{x^2} - \frac{5}{x^3} + \sqrt{x} - \frac{3}{\sqrt{x}} + \frac{3}{\sqrt{x}}$$

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

$$= 1 + \frac{1}{x} - \frac{5}{3x^2} + \frac{1}{2\sqrt{x}} - \frac{1}{3\sqrt{x}} + 6\sqrt{x}$$

$$\textcircled{2} \quad y = x \cdot \sqrt{1+x^2}$$

$$y' = 1 \cdot \sqrt{1+x^2} + x \cdot \left( (1+x^2)^{\frac{1}{2}} \right)' =$$

$$= \sqrt{1+x^2} + x \left( \frac{1}{2} (1+x^2)^{-\frac{1}{2}} \right) =$$

$$\sqrt{1+x^2} + x \left( \frac{1}{2\sqrt{1+x^2}} \right) = \sqrt{1+x^2} \cdot \left( 1 + \frac{x}{2\sqrt{1+x^2}} \right) =$$

$$\textcircled{3} \quad y = \frac{1+x^2}{1-x^2} \cdot x \cdot \sqrt{1+x^2}$$

$$y' = \frac{2 \cdot (1-x^2) - 2x(-2x)}{(1-x^2)^2} =$$

$$= \frac{2 - 2x^2 + 4x^2}{1 - 2x^2 + x^4} = \frac{2 + 2x^2}{x^4 - 2x^2 + 1} = \frac{2}{x^2 + 1}$$



$$\textcircled{5} \quad y = \ln(x + \sqrt{x^2 + 1})$$

$$y' = \frac{1}{(x + \sqrt{x^2 + 1})'} = \frac{1}{1 + (\sqrt{x^2 + 1})'}$$

$$= \frac{1}{1 + \frac{1}{2}(x^2 + 1)^{-\frac{1}{2}}} = \frac{1}{1 + \frac{x}{\sqrt{x^2 + 1}}} = \frac{\sqrt{x^2 + 1}}{1 + x}$$

$$\textcircled{6} \quad y = x \cdot \ln(x + \sqrt{x^2 + 1}) - \sqrt{x^2 + 1}$$

$$y' = 1 \cdot (\ln(x + \sqrt{x^2 + 1})) + x \cdot (\ln(x + \sqrt{x^2 + 1}))' -$$

$$- \frac{1}{2\sqrt{x^2 + 1}} = \ln(x + \sqrt{x^2 + 1}) +$$

$$+ x \cdot \frac{1}{x + \sqrt{x^2 + 1}} - \frac{1}{2\sqrt{x^2 + 1}} =$$

$$= \ln(x + \sqrt{x^2 + 1})$$