

Math 112
Derivative Skills Practice – Answers

1. $y = \frac{4x}{e^{x^2}}$

$$\frac{dy}{dx} = \frac{e^{x^2} \cdot 4 - 4x \cdot (e^{x^2})(2x)}{(e^{x^2})^2}$$

2. $y = x \cdot \sqrt[4]{1+x^2} = x \cdot (1+x^2)^{\frac{1}{4}}$

$$\frac{dy}{dx} = x \cdot \frac{1}{4}(1+x^2)^{-\frac{3}{4}}(2x) + (1+x^2)^{\frac{1}{4}} \cdot (1)$$

3. $y = e^{\sqrt{x}} \cdot \ln 2x$

$$\frac{dy}{dx} = e^{\sqrt{x}} \cdot \left(\frac{1}{2x}\right) (2) + \ln 2x \cdot (e^{\sqrt{x}}) \left(\frac{1}{2}x^{-\frac{1}{2}}\right)$$

4. $y = \frac{x^3}{e^{x+\ln x}}$

$$\frac{dy}{dx} = \frac{e^{x+\ln x} \cdot 3x^2 - x^3 \cdot (e^{x+\ln x}) \left(1 + \frac{1}{x}\right)}{(e^{x+\ln x})^2}$$

5. $y = \left(x + \frac{1}{x}\right)^7$

$$\frac{dy}{dx} = 7 \left(x + \frac{1}{x}\right)^6 (1 - x^{-2})$$

6. $y = \sqrt{\ln \sqrt{x}} = (\ln x^{1/2})^{1/2}$

$$\frac{dy}{dx} = \frac{1}{2}(\ln x^{1/2})^{-1/2} \left(\frac{1}{x^{1/2}}\right) \left(\frac{1}{2}x^{-1/2}\right)$$

7. $y = (x^2 + 6)^2(3x - 7)^8$

$$\frac{dy}{dx} = (x^2 + 6)^2 \cdot 8(3x - 7)^7(3) + (3x - 7)^8 \cdot 2(x^2 + 6)(2x)$$

8. $y = \left(\frac{x^3 - 2x}{5x^4 + 7}\right)^{10}$

$$\frac{dy}{dx} = 10 \left(\frac{x^3 - 2x}{5x^4 + 7}\right)^9 \left[\frac{(5x^4 + 7)(3x^2 - 2) - (x^3 - 2x)(20x^3)}{(5x^4 + 7)^2}\right]$$

9. $y = (7x^6 - 9x^4) \cdot \ln(1 + (4x)^3)$

$$\frac{dy}{dx} = (7x^6 - 9x^4) \cdot \frac{1}{1 + (4x)^3} \cdot 3(4x)^2(4) + \ln(1 + (4x)^3) \cdot (42x^5 - 36x^3)$$

10. $y = \sqrt{x} - \frac{1}{\sqrt{x}} = x^{1/2} - x^{-1/2}$

$$\frac{dy}{dx} = \frac{1}{2}x^{-1/2} + \frac{1}{2}x^{-3/2}$$