

Assignment

Date _____ Period _____

Differentiate each function with respect to x .

1) $f(x) = (x^5 + 2)^3$

$$3(x^5 + 2)^2 \cdot 5x^4$$

$$\boxed{15x^4(x^5 + 2)^2}$$

2) $f(x) = \sqrt{-3x^4 - 5} = (-3x^4 - 5)^{1/2}$

$$1/2(-3x^4 - 5)^{-1/2} \cdot -12x^3$$

$$\boxed{\frac{-6x^3}{(-3x^4 - 5)^{1/2}}}$$

3) $f(x) = (x^2 + 2)(-3x^4 + 5)^5$

$$(x^2 + 2) \cdot 5(-3x^4 + 5)^4 \cdot (-12x^3) + 2x(-3x^4 + 5)^5$$

$$-60x^3(x^2 + 2)(-3x^4 + 5)^4 + 2x(-3x^4 + 5)^5$$

$$2x(-3x^4 + 5)^4 [-30x^2(x^2 + 2) + (-3x^4 + 5)]$$

$$2x(-3x^4 + 5)^4 [-30x^4 - 60x^2 - 3x^4 + 5]$$

$$\boxed{2x(-3x^4 + 5)^4 (-33x^4 - 60x^2 + 5)}$$

4) $f(x) = \frac{-3x^5 + 4}{(-5x - 3)^4}$

$$\frac{(-5x - 3)^4(-15x^4) - (-3x^5 + 4) \cdot 4(-5x - 3)^3 \cdot (-5)}{((-5x - 3)^4)^2} = \frac{5(-5x - 3)^3 [-3x^4(-5x - 3) + 4(-3x^5 + 4)]}{(-5x - 3)^8}$$

$$\frac{5[15x^5 + 9x^4 - 12x^5 + 16]}{(-5x - 3)^5} = \boxed{\frac{5(3x^5 + 9x^4 + 16)}{(-5x - 3)^5}}$$

5) $f(x) = e^{e^{3x^3}}$

$$e^{e^{3x^3}} \cdot e^{3x^3} \cdot 9x^2$$

$$\boxed{9x^2 \cdot e^{(e^{3x^3} + 3x^3)}}$$

6) $f(x) = e^{5x^2}(e^{5x^3} + 3)$

$$e^{5x^2} \cdot e^{5x^3} \cdot 15x^2 + e^{5x^2} \cdot 10x \cdot (e^{5x^3} + 3)$$

$$5x e^{5x^2} (e^{5x^3} \cdot 3x + 2(e^{5x^3} + 3))$$

$$\boxed{5x e^{5x^2} (3x e^{5x^3} + 2e^{5x^3} + 6)}$$

$$7) f(x) = e^{2x^2} \ln 3x^4 \quad e^{2x^2} \ln(3x^4)$$

$$e^{2x^2} \cdot \frac{1}{3x^4} \cdot 12x^3 + e^{2x^2} \cdot 4x \cdot \ln(3x^4)$$

$$e^{2x^2} \left(\frac{12x^3}{3x^4} + 4x \ln(3x^4) \right) = e^{2x^2} \left(\frac{4}{x} + 4x \ln(3x^4) \right)$$

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

$$\boxed{4e^{2x^2} \left(\frac{1 + x^2 \ln 3x^4}{x} \right)}$$

$$8) f(x) = \ln e^{2x^5}$$

$$f(x) = 2x^5$$

$$\boxed{f'(x) = 10x^4}$$

$$9) f(x) = \ln 4x^5$$

$$\frac{1}{4x^5} \cdot 20x^4 = \frac{20x^4}{4x^5} = \boxed{\frac{5}{x}}$$

$$\boxed{\frac{5}{x}}$$

$$10) f(x) = e^{5x^3} (5x^5 + 2)$$

$$e^{5x^3} \cdot 25x^4 + e^{5x^3} \cdot 15x^2 (5x^5 + 2)$$

$$5e^{5x^3} x^2 (5x^2 + 3(5x^5 + 2)) = 5e^{5x^3} x^2 (5x^2 + 15x^5 + 6)$$

$$\boxed{5x^2 e^{5x^3} (15x^5 + 5x^2 + 6)}$$

$$11) f(x) = e^{\ln x^3 + 2}$$

$$e^{\ln x^3 + 2} \cdot \frac{1}{x^3} \cdot 3x^2 = \frac{3x^2}{x^3} \cdot e^{\ln x^3 + 2} = \boxed{\frac{3e^{\ln x^3 + 2}}{x}}$$

$$12) f(x) = \ln 5x^4 \cdot \ln x^2$$

$$\frac{1}{5x^4} \cdot 20x^3 \cdot \ln(x^2) + \ln(5x^4) \cdot \frac{1}{x^2} \cdot 2x$$

$$\frac{20x^3}{5x^4} \ln x^2 + \frac{2x}{x^2} \ln 5x^4 = \frac{4}{x} \cdot 2 \ln x + \frac{2}{x} \ln 5x^4$$

$$\boxed{\frac{2(4 \ln x + \ln 5x^4)}{x}}$$

$$13) f(x) = \frac{e^{4x^3}}{5x^2 + 2}$$

$$\frac{(5x^2 + 2)e^{4x^3} \cdot 12x^2 - e^{4x^3} \cdot 10x}{(5x^2 + 2)^2} = 2xe^{4x^3} (6x(5x^2 + 2) - 5) = \boxed{\frac{2xe^{4x^3} (30x^3 + 12x - 5)}{(5x^2 + 2)^2}}$$

$$\boxed{\frac{2xe^{4x^3} (30x^3 + 12x - 5)}{(5x^2 + 2)^2}}$$