Name **Date** **Class**

Homework 3.4

In exercises 1 – 10, find the derivative of the function. Express your answer in simplest factored form.

1. $F(x) = x^3 e^{2x}$ Product Chain $F'(x) = 3x^2 e^{2x} + x^3 e^{2x}(2)$ $F'(x) = x^2 e^{2x}(3+2x)$	2. $P(x) = e^{-2x^2}$ natural exp. Rule $P'(x) = e^{-2x^2}(-4x)$ $P'(x) = -4x e^{-2x^2}$
3. $H(x) = e^{x \ln x}$ Product Rule $H'(x) = e^{x\ln x} \cdot \left(1 \cdot \ln x + x \cdot \frac{1}{x}\right)$ $H'(x) = (\ln x + 1) e^{x \ln x}$	4. $g(x) = (2x^2+3)e^x$ Product Rule $g'(x) = (4x)e^x + (2x^2+3)e^x$ $= e^x[4x + 2x^2 + 3]$ $g'(x) = e^x[2x^2 + 4x + 3]$
5. $J(x) = \ln(e^{2x}+1)$ $\frac{dJ(x)}{dx} = \frac{e^{2x}(2)}{e^{2x}+1}$ Log Rule $\frac{dJ(x)}{dx} = \frac{2e^{2x}}{e^{2x}+1}$	6. $F(x) = \ln(3-2x)$ $F'(x) = \frac{-2}{3-2x}$ Log Rule $F'(x) = \frac{2}{2x-3}$

7. $K(x) = \ln\sqrt{5x-2}$ $= \ln(5x-2)^{\frac{1}{2}}$

Chain Rule

$$\frac{dK}{dx} = \frac{\frac{1}{2}(5x-2)^{-\frac{1}{2}}(5)}{(5x-2)^{\frac{1}{2}}}$$

$$\frac{dK}{dx} = \frac{5}{2(5x-2)}$$

8. $F(x) = x^2 e^{4x}$

Product Rule

Natural Exp rule

$$\frac{dF}{dx} = 2x \cdot e^{4x} + x^2 \cdot e^{4x} \cdot 4$$

$$= 2xe^{4x}(1+2x)$$

$$\frac{dF}{dx} = 2xe^{4x}(2x+1)$$

9. $T(x) = \dfrac{\ln x}{x-2}$

Quotient Rule

Log Rule

$$T'(x) = \frac{\frac{1}{x}\cdot(x-2) - \ln x(1)}{(x-2)^2}$$

Quotient Rule

$$= \frac{\left(\frac{x-2}{x} - \ln x\right)}{(x-2)^2} \cdot \frac{x}{x}$$

$$T'(x) = \frac{x-2-x\ln x}{x(x-2)^2}$$

10. $P(x) = \dfrac{e^{2x}}{x^3}$

natural exp rule

$$\dot{P}(x) = \frac{e^{2x}(2)\cdot x^3 - e^{2x}(3x^2)}{(x^3)^2}$$

Quotient Rule

$$= \frac{x^2 e^{2x}(2x-3)}{x^6}$$

$$\dot{P}(x) = \frac{e^{2x}(2x-3)}{x^4}$$

11. Find the equation of the tangent line to the graph of $y = \dfrac{\ln x}{4x}$ when $x = 1$.

POT $(1,0)$

$$y = \frac{\ln(1)}{4(1)}$$

$$y = \frac{0}{4}$$

$$y = 0$$

SOT: $m = \frac{1}{4}$

$$y' = \frac{\frac{1}{x}\cdot 4x - \ln x \cdot 4}{(4x)^2}$$

$$y' = \frac{4 - 4\ln x}{16x^2}$$

$$y'(1) = \frac{4 - 4\ln(1)}{16(1)^2}$$

$$= \frac{4-4(0)}{16}$$

$$= \frac{4}{16}$$

$$y'(1) = \frac{1}{4}$$

Tangent line

$$y - 0 = \frac{1}{4}(x-1)$$