AP Calculus AB Name: *Answer Key*
Unit 3 – Day 4 – Assignment

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

1. $F(x) = x^3 e^{2x}$

$F'(x) = (3x^2)(e^{2x}) + (x^3)(e^{2x})(2)$

$= 3x^2e^{2x} + 2x^3e^{2x}$

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

2. $P(x) = e^{-2x^2}$

$P'(x) = e^{-2x^2}(-4x)$

$= -4xe^{-2x^2}$

$= \boxed{\dfrac{-4x}{e^{2x^2}}}$

3. $H(x) = e^{x\ln x}$ product rule

$H'(x) = e^{x\ln x}\left[(1)(\ln x) + (x)\left(\frac{1}{x}\right)\right]$

$= \boxed{e^{x\ln x}[\ln x + 1]}$

4. $g(x) = (2x^2+3)e^x$

$g'(x) = (4x)(e^x) + (2x^2+3)(e^x)(1)$

$= 4xe^x + 2x^2e^x + 3e^x$

$= e^x(4x + 2x^2 + 3)$

$= \boxed{e^x(2x^2+4x+3)}$

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

$J'(x) = \dfrac{e^{2x}(2)}{e^{2x}+1}$

$= \boxed{\dfrac{2e^{2x}}{e^{2x}+1}}$

6. $F(x) = \ln(3-2x)$

$F'(x) = \dfrac{-2}{3-2x}$

$= \dfrac{\cancel{-}2}{\cancel{-}1(2x-3)}$

$= \boxed{\dfrac{2}{2x-3}}$

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

$$K(x) = \ln(5x-2)^{1/2}$$

$$K'(x) = \frac{\frac{1}{2}(5x-2)^{-1/2}(5)}{(5x-2)^{1/2}}$$

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

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

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

$$F'(x) = (2x)(e^{4x}) + (x^2)(e^{4x})(4)$$

$$= 2xe^{4x} + 4x^2e^{4x}$$

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

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

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

$$\frac{\frac{x-2}{x} - \ln x \quad (x)}{(x-2)^2 \quad (x)}$$

$$\boxed{\frac{x-2-x\ln x}{x(x-2)^2}}$$

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

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

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

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

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

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

• P.O.T → $f(1) = \dfrac{\ln(1)}{4(1)} = \dfrac{0}{4} = 0$ $(1,0)$

• S.O.T → $f'(x) = \dfrac{(\cancel{4x})(\cancel{\frac{1}{x}}) - (\ln x)(4)}{(4x)^2} = \dfrac{4-4\ln x}{16x^2}$

$$f'(1) = \frac{4-4\ln(1)}{16(1)^2} = \frac{4-0}{16} = 1/4$$

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