Circle your Instructor: Faudree, Williams, Zirbes _____ / 15

Name: _____

This is a 30 minute quiz. There are 15 problems. Books, notes, calculators or any other aids are prohibited. Calculators and notes are not allowed. **Your answers should be simplified unless otherwise stated.** They should begin $y' =$ or $f'(x) =$ or $dy/dx =$, etc. There is no partial credit. If you have any questions, please raise your hand.

Circle your final answer.

For each function below, find the derivative.

1. $g(x) = 3x^e - \ln 5$

$g'(x) = 3e\,x^{e-1}$

2. $F(\theta) = \theta \sec(\theta)$

$F'(\theta) = \sec\theta + \theta \sec\theta \tan\theta$

$F'(\theta) = \sec\theta\,(1 + \theta \tan\theta)$

3. $f(x) = 10^x - \cot(5x)$

$f'(x) = (\ln 10)\,10^x + 5\csc^2(5x)$

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

$h'(x) = 3(2-x)^4 + (3x+5)\cdot 4(2-x)^3(-1)$

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

$= (2-x)^3(6-3x-12x-20)$

$= \boxed{(2-x)^3(-14-15x)}$

5. $y = \frac{x}{2} - \frac{1}{3x}$

$= \frac{1}{2}x - \frac{1}{3}x^{-1}$

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

$\boxed{y' = \frac{1}{2} + \frac{1}{3x^2}}$

6. $y = \frac{-4}{\sqrt{x^2+9}} = -4(x^2+9)^{-1/2}$

$y' = -4(-1/2)(x^2+9)^{-3/2}\cdot 2x$

$= \boxed{4x(x^2+9)^{-3/2}}$

$= \boxed{\frac{4x}{(x^2+9)^{3/2}}}$

7. $F(x) = \frac{e^x}{x^2+2}$ (Use the Quotient Rule.)

$F'(x) = \frac{(x^2+2)e^x - e^x(2x)}{(x^2+2)^2}$

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

8. $h(x) = x^2(\ln x)(\sin x)$

$h'(x) = 2x \ln x \sin x + x^2 \cdot \frac{1}{x} \sin x + x^2 \ln x \cos x$

$= \boxed{2x \ln x \sin x + x \sin x + x^2 \ln x \cos x}$

$= \boxed{x(2 \ln x \sin x + \sin x + x \ln x \cos x)}$

9. $y = 6x^{3/2}(x+3)$

$y = 6x^{5/2} + 18x^{3/2}$

$y' = 6(\frac{5}{2})x^{3/2} + 18(\frac{3}{2})x^{1/2}$

$\boxed{y' = 15x^{3/2} + 27x^{1/2}}$

$\boxed{y' = 3x^{1/2}(5x+9)}$

$\boxed{y' = 15\sqrt{x^3} + 27\sqrt{x}}$

10. $G(x) = \ln\left(\frac{xe^{3x}}{(x^2+2)^2}\right)$

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

$= \ln x + 3x - 2\ln(x^2+2)$

$G'(x) = \frac{1}{x} + 3 - \frac{2}{x^2+2} \cdot 2x$

$= \boxed{\frac{1}{x} + 3 - \frac{4x}{x^2+2}}$

11. $y = \frac{x^3 - 5x + 4}{\sqrt{x}}$

$= x^{5/2} - 5x^{1/2} + 4x^{-1/2}$

$\boxed{y' = \frac{5}{2}x^{3/2} - \frac{5}{2}x^{-1/2} - 2x^{-3/2}}$

$\boxed{y' = \frac{5x^{3/2}}{2} - \frac{5}{2\sqrt{x}} - \frac{2}{x^{3/2}}}$

12. $f(x) = (3x + \cos(2x))^{-4}$ [You don't need to simplify, but use parentheses correctly.]

$f'(x) = -4(3x + \cos(2x))^{-5}(3 - 2\sin(2x))$

$= \dfrac{-4(3 - 2\sin(2x))}{(3x + \cos(2x))^5}$

13. $H(x) = \arcsin(e^{4x})$

$H'(x) = \dfrac{4e^{4x}}{\sqrt{1 - (e^{4x})^2}}$

$= \dfrac{4e^{4x}}{\sqrt{1 - e^{8x}}}$

14. $g(x) = x^2 e^{1/x}$

$g'(x) = 2x e^{1/x} + x^2 e^{1/x} \cdot (-1x^{-2})$

$= 2xe^{1/x} - e^{1/x}$

$= e^{1/x}(2x - 1)$

15. Find dP/dr for $P = C\arctan(kr) + 2Ck$ where C and k are fixed constants.

$\dfrac{dP}{dr} = \dfrac{c}{1 + (kr)^2} \cdot k + 0$

$= \dfrac{ck}{1 + (kr)^2}$

$= \dfrac{ck}{1 + k^2r^2}$