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. $g(x) = 2x^e + \ln 2$

$g'(x) = 2e\,x^{e-1} + 0$

$\boxed{g'(x) = 2e\,x^{e-1}}$

2. $f(x) = 5^x + \cot(2x)$

$\boxed{f'(x) = (\ln 5)\,5^x - 2\csc^2(2x)}$

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

$\boxed{F'(\theta) = \sec\theta + \theta \sec\theta \tan\theta}$

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

4. $y = \frac{x}{6} - \frac{1}{4x^2}$

$= \frac{1}{6}x - \frac{1}{4}x^{-2}$

$y' = \frac{1}{6} + \frac{2}{4}x^{-3}$

$\boxed{y' = \frac{1}{6} + \frac{1}{2}x^{-3}}$

$\boxed{y' = \frac{1}{6} + \frac{1}{2x^3}}$

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

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

$= (3-x)^2\left(5(3-x) - 3(5x+2)\right)$

$= (3-x)^2(15 - 5x - 15x - 6)$

$= \boxed{(3-x)^2(9-20x)}$

6. $F(x) = \frac{e^x}{2x^2+1}$ (Use the Quotient Rule.)

$F'(x) = \frac{(2x^2+1)e^x - e^x \cdot 4x}{(2x^2+1)^2}$

$= \boxed{\frac{e^x(2x^2-4x+1)}{(2x^2+1)^2}}$

7. $y = \frac{-3}{\sqrt{x^4+4}} = -3(x^4+4)^{-1/2}$

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

$\boxed{y' = 6x^3(x^4+4)^{-3/2}}$

$\boxed{y' = \frac{6x^3}{(x^4+4)^{3/2}}}$

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

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

$= 2x \ln x \sin x + x \sin x + x^2 \ln x \cos x$

$= x(2 \ln x \sin x + \sin x + x \ln x \cos x)$

9. $y = 8x^{3/2}(x-1)$

$y = 8x^{5/2} - 8x^{3/2}$

$y' = 8(5/2)x^{3/2} - 8(3/2)x^{1/2}$

$y' = 20x^{3/2} - 12x^{1/2}$

$y' = 4x^{1/2}(5x - 3)$

10. $y = \dfrac{x^2 - 4x + 2}{\sqrt{x}}$

$= x^{3/2} - 4x^{1/2} + 2x^{-1/2}$

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

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

11. $G(x) = \ln\left(\dfrac{xe^{2x}}{(x^2+2)^4}\right)$

$= \ln x + \ln e^{2x} - 4\ln(x^2+2)$

$= \ln x + 2x - 4\ln(x^2+2)$

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

$G'(x) = \frac{1}{x} + 2 - \frac{8x}{x^2+2}$

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

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

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

13. $H(x) = \arcsin(e^{2x})$

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

$= \dfrac{2e^{2x}}{\sqrt{1 - e^{4x}}}$

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

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

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

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

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

15. Find dz/dr for $z = C\arctan(br) + Cb$ where C and b are fixed constants.

$\dfrac{dz}{dr} = \dfrac{c}{1 + (br)^2} \cdot b + 0$

$= \dfrac{cb}{1 + b^2 r^2}$

$= \dfrac{cb}{1 + (br)^2}$