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. $g(x) = 4x^{\pi} - e^2$

$g'(x) = 4\pi x^{\pi-1}$

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

$F'(\theta) = \tan\theta + \theta \sec^2\theta$

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

$f'(x) = \ln(5)\, 5^x + 3\csc^2(x)$

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

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

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

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

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

$= (2-x)^2(4-2x-6x-12)$

$= -(2-x)^2(8x+8)$

$= -8(2-x)^2(x+1)$

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

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

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

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

8. $z = \frac{2s^2-3s+1}{\sqrt{s}}$ $= 2s^{3/2} - 3s^{1/2} + s^{-1/2}$

$z' = 3s^{1/2} - \frac{3}{2}s^{-1/2} - \frac{1}{2}s^{-3/2}$

9. $y = 2x^{5/2}(x-3)$ $= 2x^{7/2} - 6x^{5/2}$

$y' = 7x^{5/2} - 15x^{3/2}$

$= x^{3/2}(7x - 15)$

10. $G(x) = \ln\left(\frac{xe^x}{(x^2+5)^2}\right)$ $= \ln(x) + x - 2\ln(x^2+5)$

$G'(x) = \frac{1}{x} + 1 - \frac{2}{x^2+5} \cdot 2x$

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

11. $h(x) = xe^x(\sin x)$

$h'(x) = e^x \sin x + xe^x \sin x + xe^x \cos(x)$

$= e^x(\sin x + x\sin x + x\cos(x))$

12. $H(x) = \arccos(\ln(4x))$

$$H'(x) = \frac{-1}{\sqrt{1-[\ln(4x)]^2}} \cdot \frac{1}{4x} \cdot 4 = \frac{-1}{x\sqrt{1-(\ln(4x))^2}}$$

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

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

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

$$g'(x) = e^{1/x^2} + x\,e^{1/x^2} \cdot \left(\frac{-2}{x^3}\right)$$

$$= e^{1/x^2}\left[1 - \frac{2}{x^2}\right]$$

15. Find dP/dr for $P = A\arctan(mr) + 2Am$ where A and m are fixed constants.

$$\frac{dP}{dr} = \frac{A \cdot m}{1 + (mr)^2} = \frac{Am}{1 + m^2r^2}$$