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

Name: Solutions Zirbes

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. $g(x) = 2x^{4.1} - \sqrt{5x} + \pi^2$

$= 2x^{4.1} - \sqrt{5}\sqrt{x} + \pi^2$

$\boxed{g'(x) = 8.2\, x^{3.1} - \frac{\sqrt{5}}{2} x^{-1/2}}$

$\boxed{g'(x) = 8.2\, x^{3.1} - \frac{\sqrt{5}}{2\sqrt{x}}}$

$\boxed{g'(x) = 8.2\, x^{3.1} - \frac{5}{2\sqrt{5x}}}$

2. $f(x) = 3^x + \cot(4x)$

$\boxed{f'(x) = (\ln 3)\, 3^x - 4\csc^2(4x)}$

3. $F(\theta) = 4\theta\tan(\theta)$

$\boxed{F'(\theta) = 4\tan\theta + 4\theta\sec^2\theta}$

$\boxed{F'(\theta) = 4(\tan\theta + \theta\sec^2\theta)}$

4. $h(x) = (2x+1)(3-x)^5$

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

$$= \boxed{2(3-x)^5 - 5(2x+1)(3-x)^4}$$

$$= \boxed{(3-x)^4\left(2(3-x) - 5(2x+1)\right)}$$

$$= \boxed{(3-x)^4(1-12x)}$$

these answers got full credit this time, but will not next time.

this is the form your answer will need to be in on the retake.

5. $y = \frac{\sqrt{3}}{5} - \frac{1}{5x} + \frac{x}{4}$

$$= \frac{\sqrt{3}}{5} - \frac{1}{5}x^{-1} + \frac{1}{4}x$$

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

$$\boxed{y' = \frac{1}{5x^2} + \frac{1}{4}}$$

$$\boxed{y' = \frac{4+5x^2}{20x^2}}$$

6. $y = \frac{-4}{\sqrt{x^2+25}}$

$$= -4(x^2+25)^{-1/2}$$

$$y' = -4(-1/2)(x^2+25)^{-3/2}\cdot 2x$$

$$= \boxed{4x(x^2+25)^{-3/2}}$$

$$= \boxed{\frac{4x}{(x^2+25)^{3/2}}}$$

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

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

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

$$= \boxed{\frac{e^x(x^2-3x+2)}{(x^2-x+1)^2}}$$

Do NOT use the quotient rule!

8. $z = \frac{t^4-8t+3}{\sqrt{t}} = \frac{t^4}{t^{1/2}} - \frac{8t}{t^{1/2}} + \frac{3}{t^{1/2}}$

$$\boxed{z' = \frac{7}{2}t^{5/2} - \frac{4}{\sqrt{t}} - \frac{3}{2t^{3/2}}}$$

$$= t^{7/2} - 8t^{1/2} + 3t^{-1/2}$$

$$\boxed{z' = \frac{7}{2}t^{5/2} - 4t^{-1/2} - \frac{3}{2}t^{-3/2}}$$

$$\boxed{z' = \frac{7t^{5/2}}{2} - \frac{4}{t^{1/2}} - \frac{3}{2t^{3/2}}}$$

$$z' = \frac{7t^{5/2}}{2}\frac{t^{3/2}}{t^{3/2}} - \frac{4}{t^{1/2}}\frac{2t}{2t} - \frac{3}{2t^{3/2}}$$

$$\boxed{z' = \frac{7t^4 - 8t - 3}{2t^{3/2}}}$$

9. $y = 12x^{4/3}(x+3)$

$$y = 12x^{7/3} + 36x^{4/3}$$

$$y' = 12(7/3)x^{4/3} + 36(4/3)x^{1/3}$$

$$\boxed{y' = 28x^{4/3} + 48x^{1/3}}$$

$$\boxed{y' = 4x^{1/3}(7x+12)}$$

$$\boxed{y' = x^{1/3}(28x+48)}$$

10. $G(x) = \ln\left(\frac{xe^x}{(x^2+1)^3}\right)$

$$= \ln x + \ln e^x - 3\ln(x^2+1)$$

$$= \ln x + x - 3\ln(x^2+1)$$

$$G'(x) = \boxed{\frac{1}{x} + 1 - \frac{6x}{x^2+1}}$$

$$= \frac{x^2+1 + x(x^2+1) - 6x \cdot x}{x(x^2+1)}$$

$$= \boxed{\frac{x^3 - 5x^2 + x + 1}{x(x^2+1)}}$$

11. $h(x) = x(\ln x)(\cos x)$

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

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

I took $+ x\ln x(-\sin x)$

12. $H(x) = \arctan(e^{3x})$

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

$$= \boxed{\frac{3e^{3x}}{1+e^{6x}}}$$

13. $f(x) = (x + \sec(2x))^{-7}$ [You don't need to simplify, but use parentheses correctly.]

$$\boxed{f'(x) = -7(x+\sec(2x))^{-8}(1+2\sec(2x)\tan(2x))}$$

$$= \boxed{\frac{-7(1+2\sec(2x)\tan(2x))}{(x+\sec(2x))^8}}$$

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

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

$$= \boxed{e^{1/x} - x^{-1}e^{1/x}}$$

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

$$= \boxed{e^{1/x} - \frac{e^{1/x}}{x}}$$

$$= \boxed{e^{1/x}\left(\frac{x-1}{x}\right)}$$

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

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

$$= \boxed{\frac{-Ck}{\sqrt{1-k^2r^2}}}$$

$$= \boxed{\frac{-ck}{\sqrt{1-(kr)^2}}}$$