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. $g(x) = 2x^{3.2} - \sqrt{3x} + e^4$

$= 2x^{3.2} - \sqrt{3}\, x^{1/2} + e^4$

$\boxed{g'(x) = 6.4x^{2.2} - \frac{\sqrt{3}}{2} x^{-1/2}}$

$\boxed{g'(x) = 6.4x^{2.2} - \frac{\sqrt{3}}{2\sqrt{x}}}$

$\boxed{g'(x) = 6.4x^{2.2} - \frac{3}{2\sqrt{3x}}}$

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

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

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

3. $f(x) = 4^x + \csc(8x)$

$\boxed{f'(x) = (\ln 4)4^x - 8\csc(8x)\cot(8x)}$

4. $y = \frac{-9}{\sqrt{x^2+16}} = -9(x^2+16)^{-1/2}$

$$\boxed{y' = \frac{9x}{\sqrt{(x^2+16)^3}}}$$

$$y' = -9\left(-\frac{1}{2}\right)(x^2+16)^{-3/2} \cdot 2x$$

$$\boxed{y' = 9x\,(x^2+16)^{-3/2}}$$

$$\boxed{y' = \frac{9x}{(x^2+16)^{3/2}}}$$

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

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

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

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

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

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

these answers were given credit this time, but will not get credit on the retake.

these will be the only accepted versions on the retake.

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

$$= \frac{\sqrt{2}}{3} - \frac{1}{3}x^{-1} + \frac{1}{5}x$$

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

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

$$\boxed{y' = \frac{5+3x^2}{15x^2}}$$

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. $z = \frac{t^3-9t+4}{\sqrt{t}} = \frac{t^3}{t^{1/2}} - \frac{9t}{t^{1/2}} + \frac{4}{t^{1/2}}$

$= t^{5/2} - 9t^{1/2} + 4t^{-1/2}$

$\boxed{z' = \frac{5}{2}t^{3/2} - \frac{9}{2}t^{-1/2} - 2t^{-3/2}}$

$z' = \frac{5t^{3/2}}{2}\frac{t^{3/2}}{t^{3/2}} - \frac{9}{2t^{1/2}}\frac{t}{t} - \frac{2}{t^{3/2}}\frac{2}{2}$

$\boxed{z' = \frac{5t^3 - 9t - 4}{2t^{3/2}}}$

$\boxed{z' = \frac{5}{2}t^{3/2} - \frac{9}{2\sqrt{t}} - \frac{2}{t^{3/2}}}$

9. $y = 15x^{4/3}(x+2)$

$= 15x^{7/3} + 30x^{4/3}$

$y' = 15(7/3)x^{4/3} + 30(4/3)x^{1/3}$

$\boxed{y' = 35x^{4/3} + 40x^{1/3}}$ ← this is good enough.

$\boxed{y' = 5x^{1/3}(7x+8)}$

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

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

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

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

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

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

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

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 gave credit for $+x\ln x(-\sin x)$ in the last term.

12. $H(x) = \arctan(e^{2x})$

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

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

13. $f(x) = (x + \sec(9x))^{-3}$ [You don't need to simplify, but use parentheses correctly.]

$$\boxed{f'(x) = -3(x+\sec(9x))^{-4}(1+9\sec(9x)\tan(9x))}$$

$$\boxed{f'(x) = \frac{-3(1+9\sec(9x)\tan(9x))}{(x+\sec(9x))^4}}$$

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

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

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

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

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

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

15. Find dP/dr for $P = A\arcsin(cr) + 2Ac$ where A and c are fixed constants.

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

$$\boxed{\frac{dP}{dr} = \frac{AC}{\sqrt{1-(cr)^2}}}$$

$$\boxed{\frac{dP}{dr} = \frac{Ac}{\sqrt{1-c^2r^2}}}$$