Calculus Name_____

Chain Rule and Trig. Derivatives A

Differentiate each. Simplify your answers appropriately.

1. $f(x) = 3x - \cot x$

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

2. $f(x) = \frac{1}{x}\cos x = x^{-1}\cos x$

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

$= -\frac{\sin x}{x} - \frac{\cos x}{x^2}$ common denominator

$= -\frac{x\sin x}{x^2} - \frac{\cos x}{x^2} = \frac{-x\sin x - \cos x}{x^2}$

or//

$f(x) = \frac{1}{x}\cos x = \frac{\cos x}{x}$

$f'(x) = \frac{x(-\sin x) - \cos x}{x^2} = \frac{-x\sin x - \cos x}{x^2}$

3. $y = x^2 \cos x$

$y' = x^2(-\sin x) + \cos x \cdot 2x$

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

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

$y' = \frac{\sin x(2x-6) - (x^2-6x)(\cos x)}{\sin^2 x}$

$= \frac{\sin x(2x-6) - \cos x(x^2-6x)}{\sin^2 x}$

5. $f(x) = e^x \tan x$

$f'(x) = e^x\sec^2 x + \tan x e^x$

$= e^x(\sec^2 x + \tan x)$

6. $y = e^x \sec x$

$y' = e^x \sec x \tan x + \sec x e^x$

$= e^x \sec x(\tan x + 1)$

Calculus Name_____

Chain Rule and Trig. Derivatives A

7. $f(x) = 5\csc x$

$f'(x) = \boxed{-5\csc x \cot x}$

8. $y = (2x^4 - 3x)^6$

$y' = \boxed{6(2x^4-3x)^5(8x^3-3)}$

9. $y = e^{\sin x}$

$y' = e^{\sin x} \cdot \cos x$

$= \boxed{\cos x\, e^{\sin x}}$

10. $y = \cos^2\theta = (\cos(\theta))^2$

$y' = 2(\cos\theta)(-\sin\theta)$

$= \boxed{-2\cos\theta\sin\theta}$

11. $y = \sin(x^3)$

$y' = \cos(x^3) \cdot 3x^2$

$= \boxed{3x^2\cos(x^3)}$

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

$y' = \frac{1}{2}(3x^4-x)^{-1/2}(12x^3-1)$

$= \boxed{\dfrac{12x^3-1}{2\sqrt{3x^4-x}}}$