

**HW 28: Derivatives of Trigonometric Functions w/t Chain Rule (3.6)**

**Examples**

<p>1. <math>y = \tan 5x</math>  <math>y = \tan \boxed{5x}</math>  <math>y' = \sec^2 \boxed{5x} \cdot 5</math>  <math>y' = 5 \sec^2 \boxed{5x}</math></p>	<p>2. <math>y = \sec 5x</math>  <math>y = \sec \boxed{5x}</math>  <math>y' = \sec \boxed{5x} \tan \boxed{5x} \cdot 5</math>  <math>y' = 5 \sec \boxed{5x} \tan \boxed{5x}</math></p>	<p>3. <math>y = \cot^4 3x</math>  <math>y = \boxed{\cot 3x}^4</math>  <math>y' = 4 \boxed{\cot 3x}^3 \left[ -\csc^2 3x \right] \cdot 3</math>  <math>y' = -12 \boxed{\cot 3x}^3 \csc^2 3x</math></p>	<p>4. <math>y = \csc^3 2x</math>  <math>y = \boxed{\csc 2x}^3</math>  <math>y' = 3 \boxed{\csc 2x}^2 \left[ -\csc 2x \cot 2x \right] \cdot 2</math>  <math>y' = -6 \boxed{\csc 2x}^2 \cot 2x</math></p>
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Use the **quotient rule** to **prove** the derivative of: (Hint: change into sin x and cos x and then take derivative)

1.  $\tan x$

2.  $\cot x$

3.  $\sec x$

4.  $\csc x$

**Find dy/dx.**

5.  $y = \sec 4x$

6.  $y = \tan 3x - \cot 3x$

7.  $y = \cot 5x + \csc 5x$

8.  $y = \csc^3(2x)$

9.  $y = \tan x + \cot x$

10.  $y = 4\sec x - 2\csc x$

11.  $y = 3\sec x \cdot \tan x$

12.  $y = \sin x \cdot \tan x$

13.  $y = \cot x \cdot \csc x$

14.  $y = \cos x \cdot \cot x$

15.  $y = \frac{2 \cos x}{x+1}$

16.  $y = \frac{\sin x}{x}$

17.  $y = \frac{\sin x}{1 - \cos x}$

18.  $y = \frac{x+2}{\cos x}$

19.  $y = \frac{\tan x}{\cos x - 4}$

20.  $y = \frac{\cot x}{1 - \sin x}$

**Answers:**

1. $\sec^2 x$	2. $-\csc^2 x$	3. $\sec x \tan x$
4. $-\csc x \cot x$	5. $4 \sec 4x \tan 4x$	6. $3(\sec^2 3x + \csc^2 3x)$
7. $-5 \csc 5x (\csc 5x + \cot 5x)$	8. $-6 \csc^3(2x) \cot(2x)$	9. $\sec^2 x - \csc^2 x$
10. $2(2 \sec x \tan x + \csc x \cot x)$	11. $3 \sec x (\tan^2 x + \sec^2 x)$	12. $\sin x (1 + \sec^2 x)$
13. $-\csc x (\csc^2 x + \cot^2 x)$	14. $-\cos x (1 + \csc^2 x)$	15. $\frac{-2(x \sin x + \sin x + \cos x)}{(x+1)^2}$
16. $\frac{x \cos x - \sin x}{x^2}$	17. $\frac{1}{\cos x - 1}$	18. $\frac{\cos x + x \sin x + 2 \sin x}{\cos^2 x}$
19. $\frac{\sec x - 4 \sec^2 x + \tan x \sin x}{(\cos x - 4)^2}$	20. $\frac{-\csc^2 x + \csc x + \cot x \cos x}{(1 - \sin x)^2}$	