

5.3 TRIG IDENTITIES

WARM-UP (IN NOTES)

Simplify

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

$$2. (2x+5)(2x+5) = 4x^2 + 10x + 10x + 25$$
$$\boxed{4x^2 + 20x + 25}$$

$$3. \frac{x^2 + 5x - 6}{(x-1)(x+2)}$$
~~$$\frac{(x-1)(x+6)}{(x-1)(x+2)}$$~~
$$= \boxed{\frac{x+6}{x+2}}$$

5.3 TRIG IDENTITIES

EQ:

How do I use trigonometric identities to transform expressions?

Reciprocal

$$\cot x = \frac{1}{\tan x}$$

or $\tan x \cot x = 1$ OR $\tan x = \frac{1}{\cot x}$

$$\sec x = \frac{1}{\cos x}$$

or $\cos x \sec x = 1$ OR $\cos x = \frac{1}{\sec x}$

$$\csc x = \frac{1}{\sin x}$$

or $\sin x \csc x = 1$ OR $\sin x = \frac{1}{\csc x}$

5.3 TRIG IDENTITIES

EQ:

How do I use trigonometric identities to transform expressions?

Quotient

$$\tan x = \frac{\sin x}{\cos x} = \frac{\sec x}{\csc x}$$

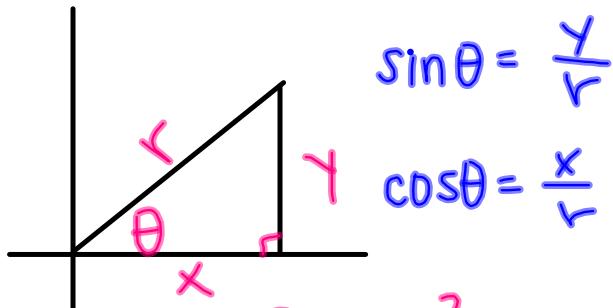
$$\cot x = \frac{\cos x}{\sin x} = \frac{\csc x}{\sec x}$$

5.3 TRIG IDENTITIES

EQ:

How do I use trigonometric identities to transform expressions?

Pythagorean



$$\sin \theta = \frac{y}{r}$$

$$\cos \theta = \frac{x}{r}$$

$$\frac{x^2}{r^2} + \frac{y^2}{r^2} = \frac{r^2}{r^2}$$

$$\left(\frac{x}{r}\right)^2 + \left(\frac{y}{r}\right)^2 = 1$$

$$\cos^2 \theta + \sin^2 \theta = 1$$

5.3 TRIG IDENTITIES

EQ:

How do I use trigonometric identities to transform expressions?

Pythagorean

$$\cos^2 x + \sin^2 x = 1$$

$$\star 1 + \tan^2 x = \sec^2 x$$

$$\cot^2 x + 1 = \csc^2 x$$

$$\frac{\cos^2 x}{\cos^2 x} + \frac{\sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x}$$
$$1 + \tan^2 x = \sec^2 x$$

5.3 TRIG IDENTITIES

EQ:

How do I use trigonometric identities to transform expressions?

1. $\sin x \cot x$ to $\cos x$

* change everything to \sin & \cos

$$\frac{\cancel{\sin x} \cdot \cancel{\cos x}}{1} \quad \text{:(:}$$

2. $\sin x \sec x \cot x$ to 1

$$\frac{\cancel{\sin x}}{1} \cdot \frac{1}{\cancel{\cos x}} \cdot \frac{\cancel{\cos x}}{\cancel{\sin x}} \quad \text{:(:}$$

3. $(\cos x - \sec x)^2$ to $\tan^2 x - \sin^2 x$

* Squares & 1's
use Pythag.

$$(\cancel{\cos x} - \cancel{\sec x})(\cancel{\cos x} - \cancel{\sec x})$$

$$\begin{aligned} &\cancel{\cos^2 x} - \cancel{\cos x \sec x} - \cancel{\sec x \cos x} + \cancel{\sec^2 x} \\ &\cos^2 x - 1 - 1 + \sec^2 x \\ &\cos^2 x - 1 + 1 + \tan^2 x \\ &\cos^2 x - (\cos^2 x - \sin^2 x) + \tan^2 x \\ &- \sin^2 x + \tan^2 x \end{aligned}$$

$$\sec^2 x = 1 + \tan^2 x$$

$$\cos^2 x + \sin^2 x = 1$$

4. $\cos^2 x - \sin^2 x$ to $1 - 2\sin^2 x$



$$\cos^2 x + \sin^2 x = 1$$

$$-\sin^2 x - \sin^2 x$$

$$\cos^2 x = 1 - \sin^2 x$$

5. $\tan x + \cot x$ to $\csc x \sec x$

* common denominator

$$\text{CD: } \cos x \sin x$$

$$\frac{\sin x}{\sin x} \cdot \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} \cdot \frac{\cos x}{\cos x}$$

$$\begin{aligned} &\frac{\sin^2 x}{\sin x \cos x} + \frac{\cos^2 x}{\sin x \cos x} \\ &\frac{\sin^2 x + \cos^2 x}{\sin x \cos x} \leftarrow \text{Pythag.} \end{aligned}$$

$$\frac{1}{\sin x \cos x}$$

$$\frac{1}{\sin x} \cdot \frac{1}{\cos x}$$

$$= \csc x \sec x \quad \text{(:)}$$

#1-24

5.1 Reciprocal, Quotient and Pythagorean Identities

Name: _____

~~Homework odds~~

Transform the expression on the left to the expression on the right. Use a separate sheet of paper.

odds online ☺

~~in class even's~~

1. $\cos x \tan x$ to $\sin x$

2. $\csc x \tan x$ to $\sec x$

3. $\sec x \cot x \sin x$ to 1

4. $\csc x \tan x \cos x$ to 1

5. $\sin^2 x \sec x \csc x$ to $\tan x$

6. $\cos^2 x \csc x \sec x$ to $\cot x$

7. $\tan x + \cot x$ to $\csc x \sec x$

8. $\sin x + \cot x \cos x$ to $\csc x$

9. $\csc x - \sin x$ to $\cot x \cos x$

10. $\sec x - \cos x$ to $\sin x \tan x$

11. $\tan x (\sin x + \cot x \cos x)$ to $\sec x$

12. $\cos x (\sec x + \cos x \csc^2 x)$ to $\csc^2 x$

13. $(1 + \sin x)(1 - \sin x)$ to $\cos^2 x$

14. $(\sec x - 1)(\sec x + 1)$ to $\tan^2 x$

15. $(\cos x - \sin x)^2$ to $1 - 2 \cos x \sin x$

16. $(1 - \tan x)^2$ to $\sec^2 x - 2 \tan x$

17. $(\tan x + \cot x)^2$ to $\sec^2 x + \csc^2 x$

18. $(\cos x - \sec x)^2$ to $\tan^2 x - \sin^2 x$

19. $\frac{\csc^2 x - 1}{\cos x}$ to $\cot x \csc x$

20. $\frac{1 - \cos^2 x}{\tan x}$ to $\sin x \cos x$

21. $\frac{\sec^2 x - 1}{\sin x}$ to $\tan x \sec x$

22. $\frac{1 + \cot^2 x}{\sec^2 x}$ to $\cot^2 x$

23. $\frac{\sec x}{\sin x} - \frac{\sin x}{\cos x}$ to $\cot x$

24. $\frac{\csc x}{\cos x} - \frac{\cos x}{\sin x}$ to $\tan x$

25. $\frac{1}{1 - \cos x} + \frac{1}{1 + \cos x}$ to $2 \csc^2 x$

26. $\frac{1}{\sec x - \tan x} + \frac{1}{\sec x + \tan x}$ to $2 \sec x$

5.3 TRIG IDENTITIES

CLOSING

Google Classroom!

5.3 TRIG IDENTITIES CONT.

WARM-UP (NOTECARD)

Transform the expression on the left to the expression on the right.

$$\sec x - \cos x \xrightarrow{\text{to}} \sin x \tan x$$

5.3 TRIG IDENTITIES CONT.

TODAY...

Your entire 5.3 assignment
should be completed.