

Warm-Up

1) Factor: $9b^2 + b - 8$

$$(9b - 8)(b + 1)$$

2) Solve: $\frac{\theta}{4} = 9$

$$\theta = 36$$

3) Solve: $\frac{\theta}{3} = \frac{5}{7}$

$$\theta = \frac{15}{7}$$

4) Solve: $-4 + \tan 2\theta = \frac{-12 - \sqrt{3}}{3}$

$$75^\circ, 165^\circ, 255^\circ, 345^\circ$$

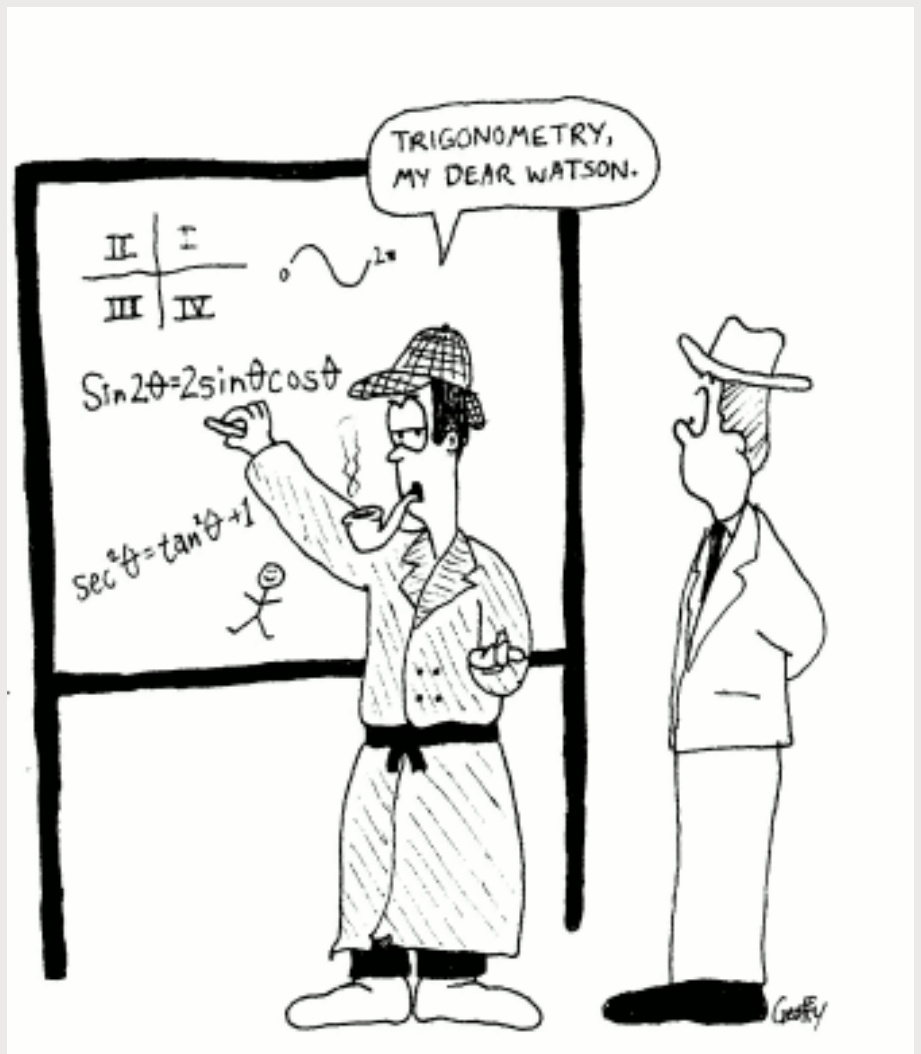
Unit 3: Trig Identities & Addition Formulas

Chapters 8 & 10



8.4 NOTES – PART I RELATIONSHIPS AMONG THE FUNCTIONS

Trig Identities



Where is the coordinate if...

1) If x is positive and y is negative?

Quadrant 4

2) If x is negative and y is positive?

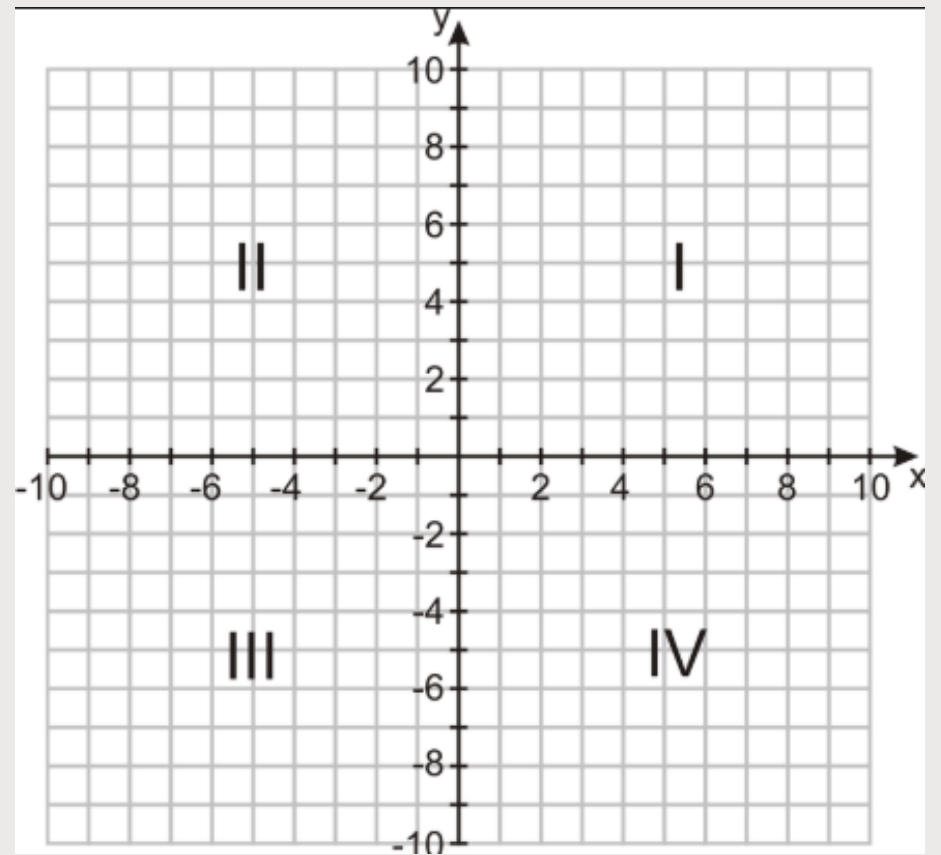
Quadrant 2

3) If x and y is are both positive?

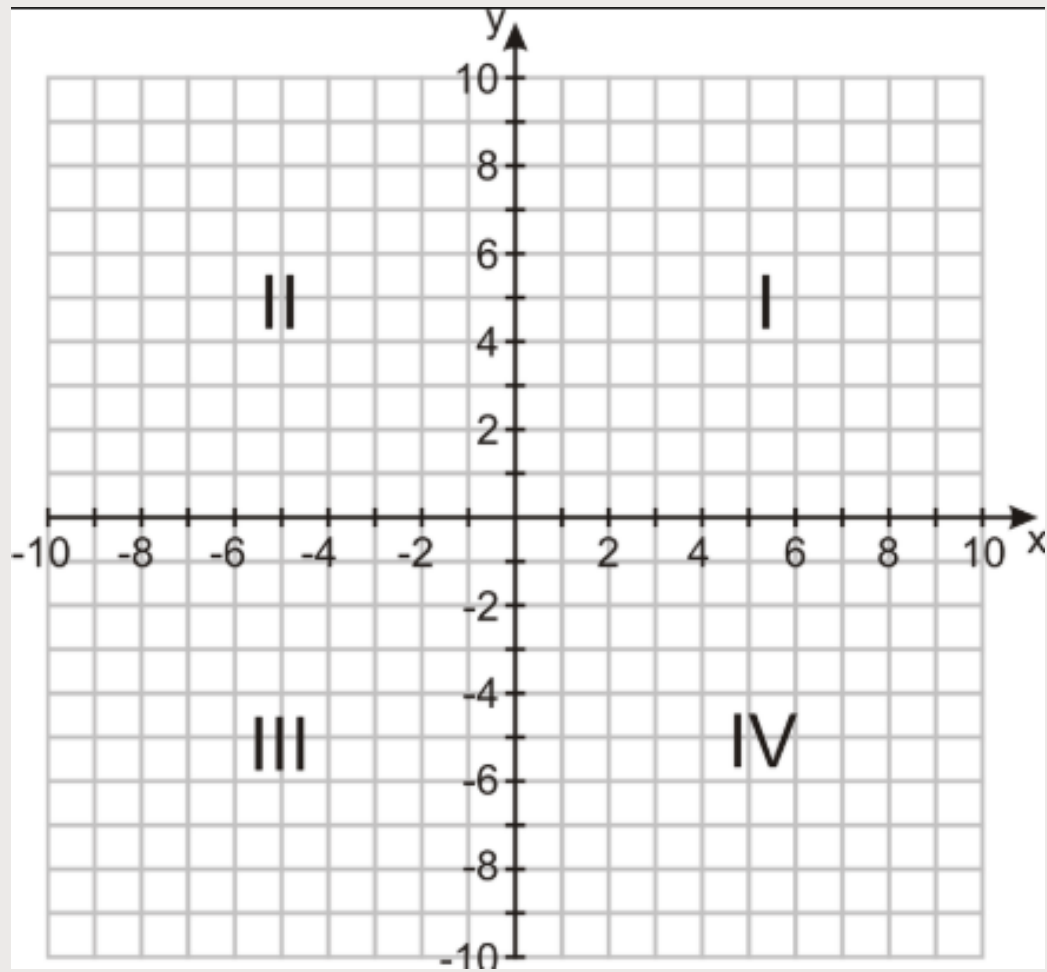
Quadrant 1

4) If x and y is are both negative?

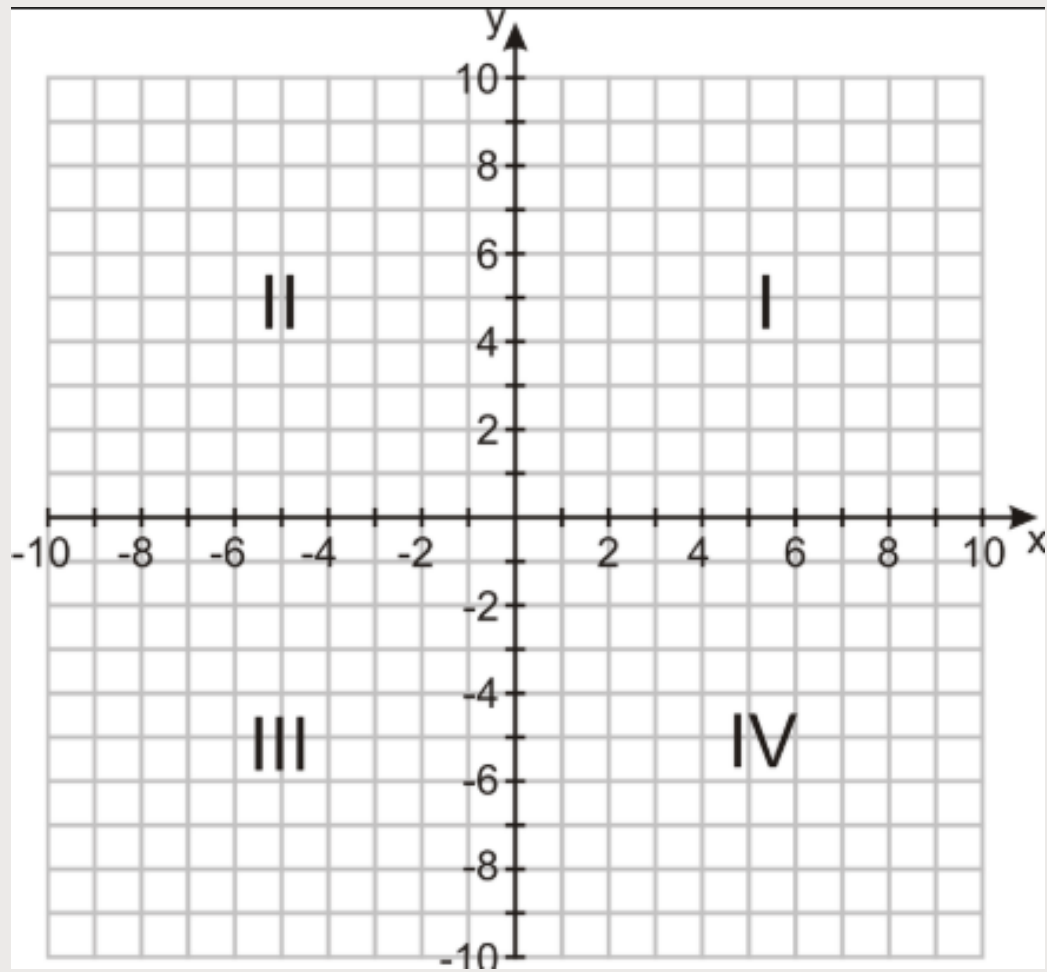
Quadrant 3



And now trig...



Your turn...



Where is θ ?

Name: _____

Date: _____

Directions: State which quadrant θ is in, based on the given information.

1) If $\cos \theta > 0$ and $\sin \theta > 0$, where is θ ?

2) If $\cos \theta > 0$ and $\sin \theta < 0$, where is θ ?

3) If $\cos \theta < 0$ and $\cot \theta > 0$, where is θ ?

4) If $\sin \theta < 0$ and $\cot \theta > 0$, where is θ ?

5) If $\sec \theta < 0$ and $\tan \theta > 0$, where is θ ?

6) If $\cos \theta < 0$ and $\csc \theta > 0$, where is θ ?

7) If $\csc \theta > 0$ and $\cos \theta > 0$, where is θ ?

8) If $\cot \theta < 0$ and $\cos \theta > 0$, where is θ ?

9) If $\csc \theta < 0$ and $\sec \theta > 0$, where is θ ?

10) If $\sec \theta < 0$ and $\csc \theta > 0$, where is θ ?

11) If $\cot \theta > 0$ and $\sin \theta > 0$, where is θ ?

12) If $\csc \theta > 0$ and $\tan \theta < 0$, where is θ ?

13) If $\cot \theta < 0$ and $\csc \theta < 0$, where is θ ?

14) If $\sin \theta > 0$ and $\sec \theta < 0$, where is θ ?

15) If $\cot \theta < 0$ and $\sin \theta < 0$, where is θ ?

16) If $\tan \theta > 0$ and $\sin \theta < 0$, where is θ ?

Where is θ ?

Name: _____

Date: _____

Directions: State which quadrant θ is in, based on the given information.

1) If $\cos \theta > 0$ and $\sin \theta > 0$, where is θ ?

1

3) If $\cos \theta < 0$ and $\cot \theta > 0$, where is θ ?

3

5) If $\sec \theta < 0$ and $\tan \theta > 0$, where is θ ?

3

7) If $\csc \theta > 0$ and $\cos \theta > 0$, where is θ ?

1

9) If $\csc \theta < 0$ and $\sec \theta > 0$, where is θ ?

4

11) If $\cot \theta > 0$ and $\sin \theta > 0$, where is θ ?

1

13) If $\cot \theta < 0$ and $\csc \theta < 0$, where is θ ?

4

15) If $\cot \theta < 0$ and $\sin \theta < 0$, where is θ ?

4

2) If $\cos \theta > 0$ and $\sin \theta < 0$, where is θ ?

4

4) If $\sin \theta < 0$ and $\cot \theta > 0$, where is θ ?

3

6) If $\cos \theta < 0$ and $\csc \theta > 0$, where is θ ?

2

8) If $\cot \theta < 0$ and $\cos \theta > 0$, where is θ ?

4

10) If $\sec \theta < 0$ and $\csc \theta > 0$, where is θ ?

2

12) If $\csc \theta > 0$ and $\tan \theta < 0$, where is θ ?

2

14) If $\sin \theta > 0$ and $\sec \theta < 0$, where is θ ?

2

16) If $\tan \theta > 0$ and $\sin \theta < 0$, where is θ ?

3

REVIEW: RECIPROCAL IDENTITIES

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

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

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

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

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

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

REVIEW: QUOTIENT IDENTITIES

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

EXAMPLE 1:

Use the values $\sin \theta = \frac{1}{2}$ and $\cot \theta = -\sqrt{3}$ to find the values of all six trig functions.

* Where is $\sin \theta > 0$ and $\cot \theta < 0$? \longrightarrow * Quadrant #2

$$\cot \theta = -\sqrt{3} \longrightarrow \tan \theta = \frac{1}{-\sqrt{3}} = -\frac{\sqrt{3}}{3}$$

EXAMPLE 1:

Use the values $\sin \theta = \frac{1}{2}$ and $\cot \theta = -\sqrt{3}$ to find the values of all six trig functions.

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \longrightarrow \cos \theta = \frac{\sin \theta}{\tan \theta}$$

$$\cos \theta = \frac{\frac{1}{2}}{-\frac{\sqrt{3}}{3}} = \frac{1}{2} \times -\frac{3}{\sqrt{3}} = -\frac{3}{2\sqrt{3}}$$

$$-\frac{3}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = -\frac{3\sqrt{3}}{2 \times 3} = -\frac{\sqrt{3}}{2}$$

EXAMPLE 1:

Use the values $\sin \theta = \frac{1}{2}$ and $\cot \theta = -\sqrt{3}$ to find the values of all six trig functions.

$$\sin \theta = \frac{1}{2}$$

$$\csc \theta = 2$$

$$\cos \theta = -\frac{\sqrt{3}}{2}$$

$$\sec \theta = -\frac{2}{\sqrt{3}} = -\frac{2\sqrt{3}}{3}$$

$$\tan \theta = -\frac{\sqrt{3}}{3}$$

$$\cot \theta = -\sqrt{3}$$

EXAMPLE 2:

Simplify: $\sec \theta - \sin \theta \tan \theta$

$$\sec \theta - \sin \theta \tan \theta = \frac{1}{\cos \theta} - \sin \theta \frac{\sin \theta}{\cos \theta} = \frac{1}{\cos \theta} - \frac{\sin^2 \theta}{\cos \theta} = \frac{1 - \sin^2 \theta}{\cos \theta}$$

$$= \frac{\cos^2 \theta}{\cos \theta} = \frac{\cos \theta \times \cos \theta}{\cos \theta} = \cos \theta$$

PYTHAGOREAN IDENTITIES

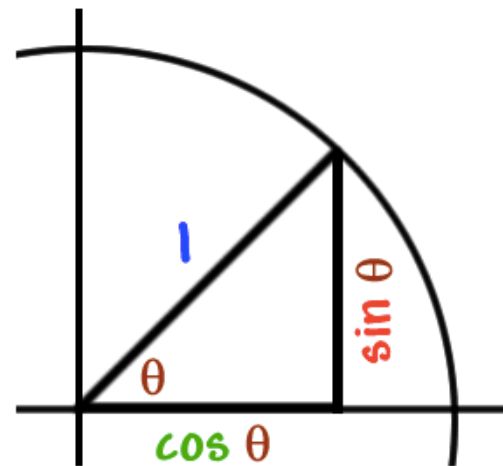
$$\sin^2 \theta + \cos^2 \theta = 1$$

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

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

$$a^2 + b^2 = c^2$$

on the unit circle.



$$a = \sin \theta \quad b = \cos \theta \quad c = 1$$

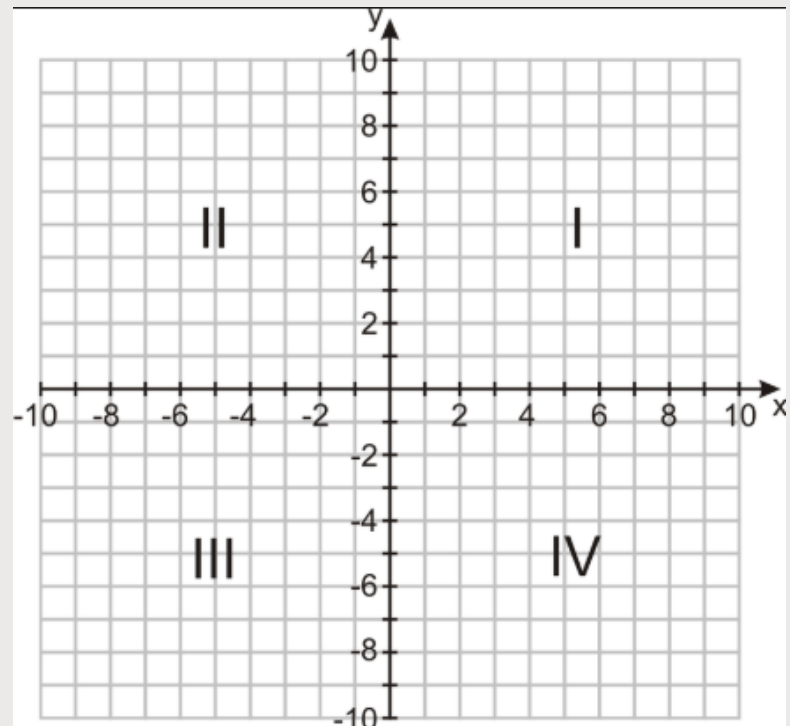
EXAMPLE 3:

Use the values $\sec \theta = -\frac{3}{2}$ and $\tan \theta > 0$ to find the values of all six trig functions.

What quadrant are we in???

Where is $\sec \theta < 0$ and $\tan \theta > 0$?

Quadrant 3



EXAMPLE 3:

Use the values $\sec \theta = -\frac{3}{2}$ and $\tan \theta > 0$ to find the values of all six trig functions.

$$\sec \theta = -\frac{3}{2} \quad \longrightarrow \quad \cos \theta = -\frac{2}{3}$$

$$\sin^2 \theta + \cos^2 \theta = 1 \qquad \sin^2 \theta = 1 - \frac{4}{9}$$

$$\sin^2 \theta + \left(-\frac{2}{3}\right)^2 = 1 \qquad \sin^2 \theta = \frac{5}{9}$$

$$\sin^2 \theta + \frac{4}{9} = 1 \qquad \sin \theta = \frac{\sqrt{5}}{3} \xrightarrow{\text{Quadrant 3}} \sin \theta = -\frac{\sqrt{5}}{3}$$

EXAMPLE 3:

Use the values $\sec \theta = -\frac{3}{2}$ and $\tan \theta > 0$ to find the values of all six trig functions.

$$\sin \theta = -\frac{\sqrt{5}}{3}$$

$$\csc \theta = -\frac{3}{\sqrt{5}} = -\frac{3\sqrt{5}}{5}$$

$$\cos \theta = -\frac{2}{3}$$

$$\sec \theta = -\frac{3}{2}$$

$$\tan \theta = \frac{-\sqrt{5}/3}{-2/3} = \frac{\sqrt{5}}{2}$$

$$\cot \theta = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$$



Honors Precalculus

Name _____

Using Pythagorean Identities

Date _____ Period ____

Use identities to find the value of each expression.

1) Find $\sin \theta$ and $\tan \theta$
if $\csc \theta = \frac{7}{4}$ and $\sec \theta > 0$.

2) Find $\tan \theta$ and $\csc \theta$
if $\cot \theta = -3$ and $\sin \theta < 0$.

YOU TRY:

3) Find $\sec \theta$ and $\csc \theta$
if $\cot \theta = 3$ and $\sin \theta < 0$.

4) Find $\tan \theta$ and $\sec \theta$
if $\csc \theta = -\frac{9}{5}$ and $\cot \theta < 0$.