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S8.1 Signs of the Trigonometric Functions  
Recall the terminal arm with angle  $\theta$  and radius  $r$ .

$\sin \theta = \frac{y}{r}$   
 $\csc \theta = \frac{r}{y}$   
 $\cos \theta = \frac{x}{r}$   
 $\sec \theta = \frac{r}{x}$   
 $\tan \theta = \frac{y}{x}$   
 $\cot \theta = \frac{x}{y}$

A right-angled triangle is shown with the origin at the vertex where the horizontal side  $x$  and vertical side  $y$  meet. The hypotenuse is labeled  $r$ . The angle  $\theta$  is indicated at the origin between the positive  $x$ -axis and the hypotenuse.

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In a cartesian plane, we will have four possible locations for the terminal arm.

A Cartesian coordinate system is shown with a horizontal  $x$ -axis and a vertical  $y$ -axis. The four quadrants are labeled: Quadrant I (top-right), Quadrant II (top-left), Quadrant III (bottom-left), and Quadrant IV (bottom-right).

Jan 27-10:08 AM

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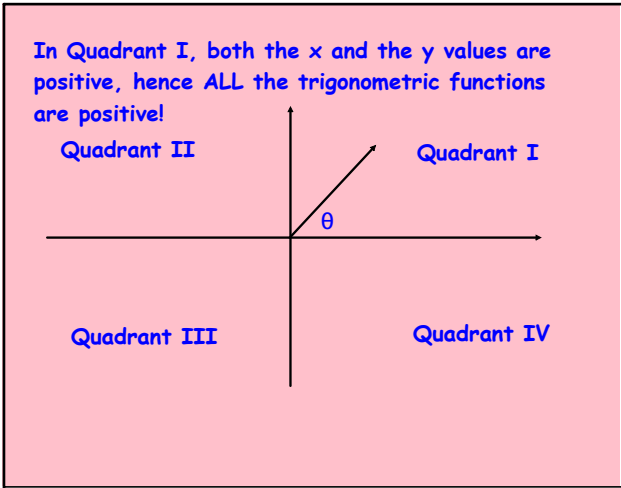
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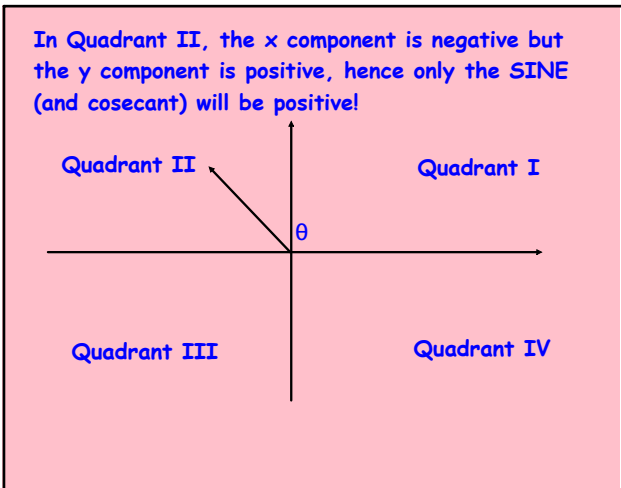
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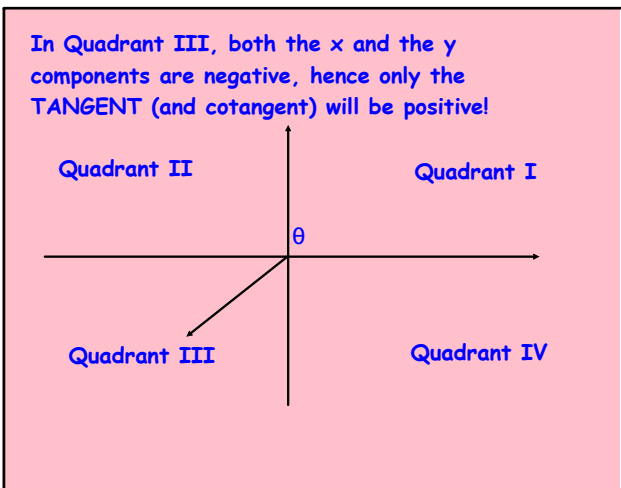
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Solution: Find the hypotenuse first (h =13) using Pythagorean Theorem.

$\sin \theta = \frac{12}{13}$        $\cos \theta = \frac{-5}{13}$        $\tan \theta = \frac{-12}{5}$   
 $\csc \theta = \frac{13}{12}$        $\sec \theta = \frac{-13}{5}$        $\cot \theta = \frac{-5}{12}$

Jan 27-11:12 AM

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Example:

State the sign of the following trigonometric functions:

- a)  $\sin 150^\circ$
- b)  $\cos 290^\circ$
- c)  $\tan 190^\circ$
- d)  $\cot 260^\circ$
- e)  $\sec 350^\circ$
- f)  $\csc 100^\circ$

Feb 1-10:02 AM

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Solution:  
Recall the CAST rule:

- a)  $\sin 150^\circ = \text{Quadrant II therefore (+) positive}$
- b)  $\cos 290^\circ = \text{Quadrant IV therefore (+) positive}$
- c)  $\tan 190^\circ = \text{Quadrant III therefore (+) positive}$
- d)  $\cot 260^\circ = \text{Quadrant III therefore (+) positive}$
- e)  $\sec 350^\circ = \text{Quadrant IV therefore (+) positive}$
- f)  $\csc 100^\circ = \text{Quadrant II therefore (+) positive}$

Feb 6-9:07 AM

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