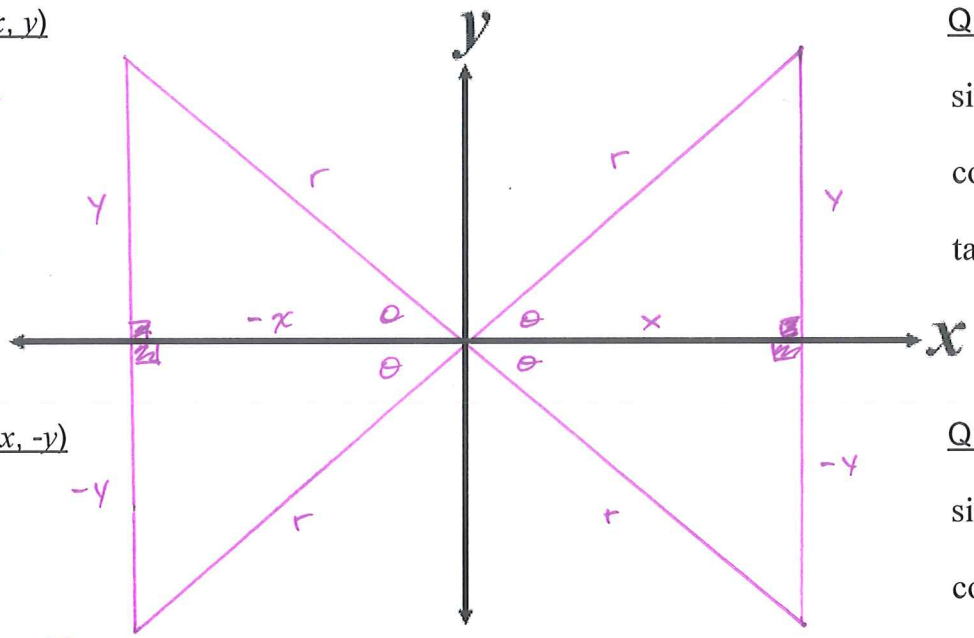
Honors Algebra II
Coordinate Trigonometric Functions

Name KEY
Date _____ Period _____

Trigonometric Functions According to Quadrants (*BOW TIE*)



Quadrant II $(-x, y)$

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

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

$\tan\theta = \frac{y}{-x}$

Quadrant I (x, y)

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

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

$\tan\theta = \frac{y}{x}$

Quadrant III $(-x, -y)$

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

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

$\tan\theta = \frac{-y}{-x} = \frac{y}{x}$

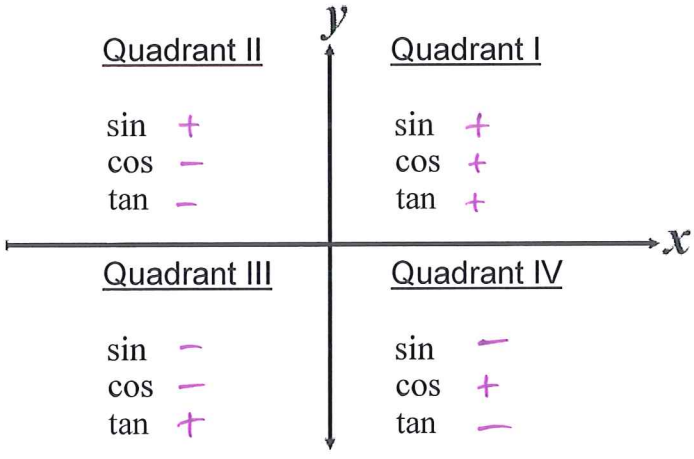
Quadrant IV $(x, -y)$

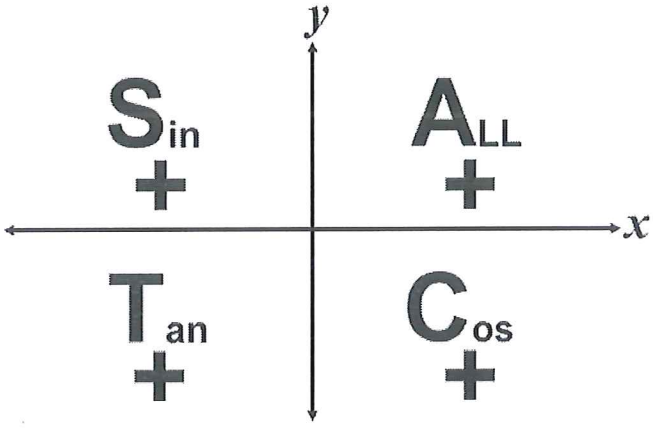
$\sin\theta = \frac{-y}{r}$

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

$\tan\theta = \frac{-y}{x}$

Charge of Trigonometric Functions According to Quadrants



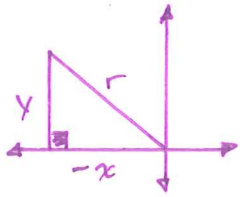


All Students Take Classes

Suppose that the point (x, y) is in the indicated quadrant. Decide whether the given ratio is positive or negative.

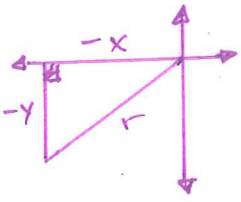
1. Quadrant II, $\frac{x}{y}$ (COT) $\frac{-}{+}$

NEGATIVE



2. Quadrant III, $\frac{y}{x}$ (TAN) $\frac{-}{-}$

POSITIVE

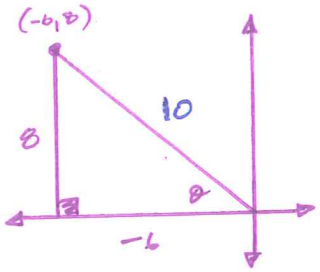


Finding Function Values of Coordinates

Given point (x, y), use the Pythagorean Theorem $\left(x^2 + y^2 = r^2\right)$ to figure out the value of *r*.

Find the values of the six, simplified trigonometric functions of angle ϑ.

3. Point (–6, 8) QII



$(-6)^2 + 8^2 = r^2$

$36 + 64 = r^2$

$100 = r^2$

$\sqrt{100} = \sqrt{r^2}$

$10 = r$

$\sin\vartheta = \frac{8}{10} = \boxed{\frac{4}{5}}$ $\quad \csc\vartheta = \frac{5}{4}$

$\cos\vartheta = \frac{-6}{10} = \boxed{\frac{-3}{5}}$ $\quad \sec\vartheta = \frac{5}{-3}$

$\tan\vartheta = \frac{8}{-6} = \boxed{\frac{4}{-3}}$ $\quad \cot\vartheta = \frac{-3}{4}$

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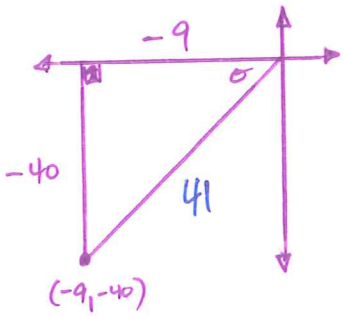
4. Point (–9, –40) QIII



$(-9)^2 + (-40)^2 = r^2$

$81 + 1600 = r^2$

$1681 = r^2$

$\sqrt{1681} = \sqrt{r^2}$

$41 = r$

$\sin\vartheta = \frac{-40}{41}$ $\quad \csc\vartheta = \frac{41}{-40}$

$\cos\vartheta = \frac{-9}{41}$ $\quad \sec\vartheta = \frac{41}{-9}$

$\tan\vartheta = \frac{-40}{-9} = \boxed{\frac{40}{9}}$ $\quad \cot\vartheta = \frac{9}{40}$

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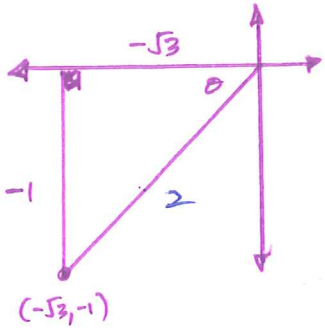
5. Point $(-\sqrt{3}, -1)$ QIII



$(-\sqrt{3})^2 + (-1)^2 = r^2$

$3 + 1 = r^2$

$4 = r^2$

$\sqrt{4} = \sqrt{r^2}$

$2 = r$

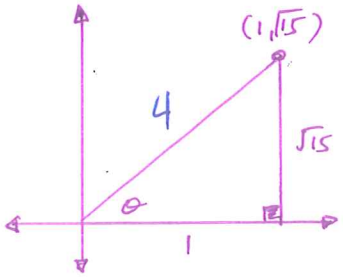
$\sin\vartheta = \frac{-1}{2}$ $\quad \csc\vartheta = \frac{-2}{}$

$\cos\vartheta = \frac{-\sqrt{3}}{2}$ $\quad \sec\vartheta = \frac{2}{-\sqrt{3}}$

$\tan\vartheta = \frac{-1}{-\sqrt{3}} = \boxed{\frac{1}{\sqrt{3}}}$ $\quad \cot\vartheta = \frac{\sqrt{3}}{}$

Find the values of the six, simplified trigonometric functions of angle ϑ.

6. Point $(1, \sqrt{15})$ (x, y) QI



$1^2 + (\sqrt{15})^2 = r^2$

$1 + 15 = r^2$

$16 = r^2$

$\sqrt{16} = \sqrt{r^2}$

$4 = r$

$\sin\vartheta = \frac{\sqrt{15}}{4}$ $\quad \csc\vartheta = \frac{4}{\sqrt{15}}$

$\cos\vartheta = \frac{1}{4}$ $\quad \sec\vartheta = \frac{4}{1}$

$\tan\vartheta = \frac{\sqrt{15}}{1}$ $\quad \cot\vartheta = \frac{1}{\sqrt{15}}$

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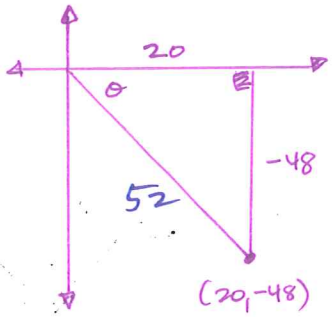
7. Point $(20, -48)$ (x, y) QIV



$20^2 + (-48)^2 = r^2$

$400 + 2304 = r^2$

$2704 = r^2$

$\sqrt{2704} = \sqrt{r^2}$

$52 = r$

$\sin\vartheta = \frac{-48}{52} = \frac{-12}{13}$ $\quad \csc\vartheta = \frac{13}{-12}$

$\cos\vartheta = \frac{20}{52} = \frac{5}{13}$ $\quad \sec\vartheta = \frac{13}{5}$

$\tan\vartheta = \frac{-48}{20} = \frac{-12}{5}$ $\quad \cot\vartheta = \frac{5}{-12}$

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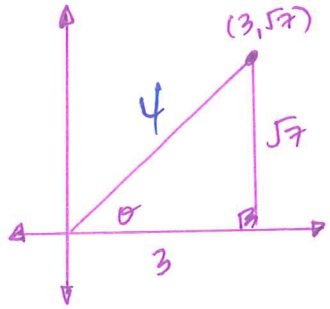
8. Point $(3, \sqrt{7})$ (x, y) QI



$3^2 + (\sqrt{7})^2 = r^2$

$9 + 7 = r^2$

$16 = r^2$

$\sqrt{16} = \sqrt{r^2}$

$4 = r$

$\sin\vartheta = \frac{\sqrt{7}}{4}$ $\quad \csc\vartheta = \frac{4}{\sqrt{7}}$

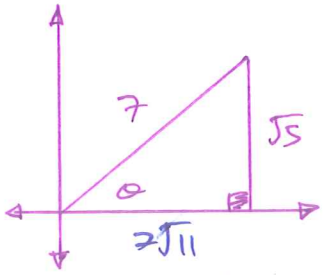
$\cos\vartheta = \frac{3}{4}$ $\quad \sec\vartheta = \frac{4}{3}$

$\tan\vartheta = \frac{\sqrt{7}}{3}$ $\quad \cot\vartheta = \frac{3}{\sqrt{7}}$

Find the values of the six, simplified trigonometric functions of angle ϑ.

9. $\sin\vartheta = \frac{\sqrt{5}}{7}$, with ϑ in quadrant I.

OPPOSITE / HYPOTENUSE



$x^2 + (\sqrt{5})^2 = 7^2$

$x^2 + 5 = 49$

$x^2 = 44$

$\sqrt{x^2} = \sqrt{44}$

$x = \sqrt{4}\cdot\sqrt{11}$

$x = 2\sqrt{11}$

$\sin\vartheta = \frac{\sqrt{5}}{7}$ (GIVEN) $\quad \csc\vartheta = \frac{7}{\sqrt{5}}$

$\cos\vartheta = \frac{2\sqrt{11}}{7} \quad \sec\vartheta = \frac{7}{2\sqrt{11}}$

$\tan\vartheta = \frac{\sqrt{5}}{2\sqrt{11}} \quad \cot\vartheta = \frac{2\sqrt{11}}{\sqrt{5}}$

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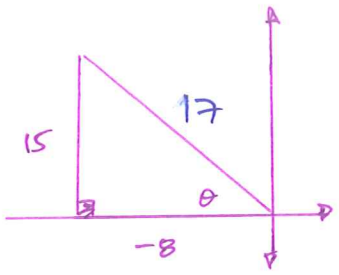
10. $\tan\vartheta = -\frac{15}{8}$, with ϑ in quadrant II.

OPPOSITE / ADJACENT



$(-8)^2 + 15^2 = r^2$

$64 + 225 = r^2$

$289 = r^2$

$\sqrt{289} = \sqrt{r^2}$

$17 = r$

$\sin\vartheta = \frac{15}{17} \quad \csc\vartheta = \frac{17}{15}$

$\cos\vartheta = \frac{-8}{17} \quad \sec\vartheta = \frac{17}{-8}$

$\tan\vartheta = \frac{15}{-8}$ (GIVEN) $\quad \cot\vartheta = \frac{-8}{15}$

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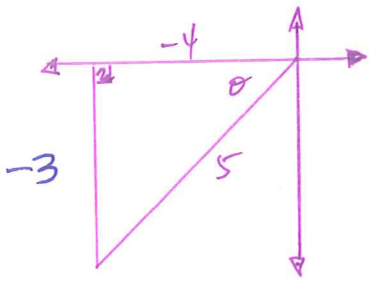
11. $\cos\vartheta = -\frac{4}{5}$, with ϑ in quadrant III.

ADJACENT / HYPOTENUSE



$(-4)^2 + y^2 = 5^2$

$16 + y^2 = 25$

$y^2 = 9$

$\sqrt{y^2} = \sqrt{9}$

$y = 3$

BUT -3 B/C QUAD III

$\sin\vartheta = \frac{-3}{5} \quad \csc\vartheta = \frac{5}{-3}$

$\cos\vartheta = \frac{-4}{5}$ (GIVEN) $\quad \sec\vartheta = \frac{5}{-4}$

$\tan\vartheta = \frac{-3}{-4} = \boxed{\frac{3}{4}} \quad \cot\vartheta = \frac{4}{3}$

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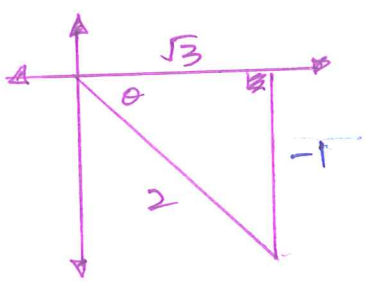
12. $\sec\vartheta = \frac{2}{\sqrt{3}}$ with ϑ in quadrant IV.

HYPOTENUSE / ADJACENT



$(\sqrt{3})^2 + y^2 = 2^2$

$3 + y^2 = 4$

$y^2 = 1$

$\sqrt{y^2} = \sqrt{1}$

$y = 1$

BUT -1 B/C QUAD IV

$\sin\vartheta = \frac{-1}{2} \quad \csc\vartheta = -2$

$\cos\vartheta = \frac{\sqrt{3}}{2} \quad \sec\vartheta = \frac{2}{\sqrt{3}}$ (GIVEN)

$\tan\vartheta = \frac{-1}{\sqrt{3}} \quad \cot\vartheta = -\sqrt{3}$