30°
150°

41) $\sin t = \frac{4}{5}$

a) $\sin(\pi - t) = \frac{4}{5}$

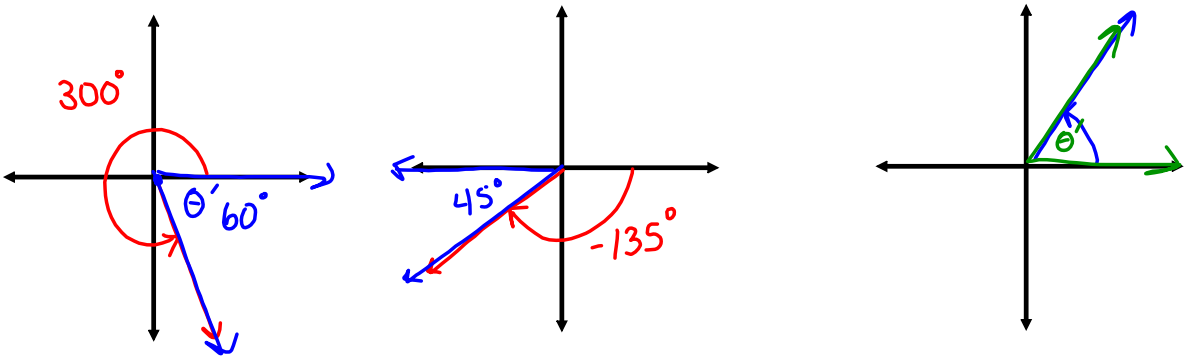
b) $\sin(t + \pi) = -\frac{4}{5}$

Section 4.4 Trigonometric functions of any angle

Reference Angle: acute, positive, vertex at origin, rays are terminal side of θ and x-axis.

Find the reference angle:

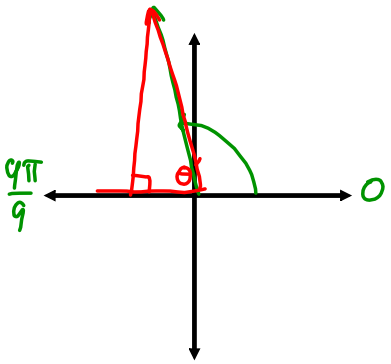
$\theta = 300^\circ$ ref. $\angle = 60^\circ$ $\theta = -135^\circ$ ref. $\angle = 45^\circ$ $\theta = 63^\circ$ ref. $\angle = 63^\circ$



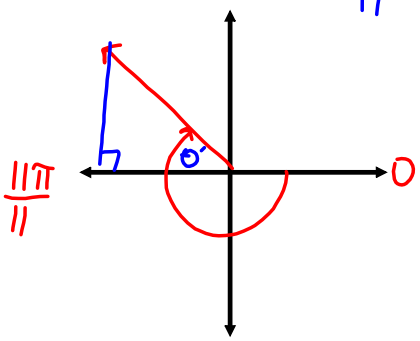
Reference triangle: terminal side is hypotenuse, one leg is x-axis, θ is at the origin

Draw the reference triangle and find the reference angle:

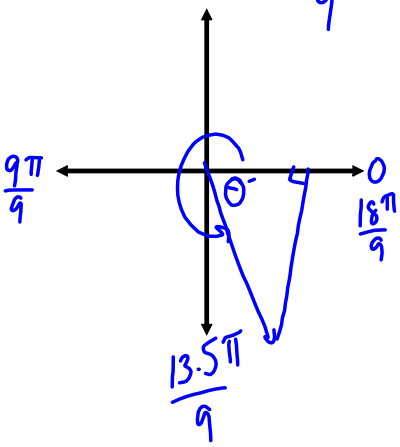
θ = 5π/9 $\theta' = \frac{4\pi}{9}$



θ = -15π/11 $\theta' = \frac{4\pi}{11}$

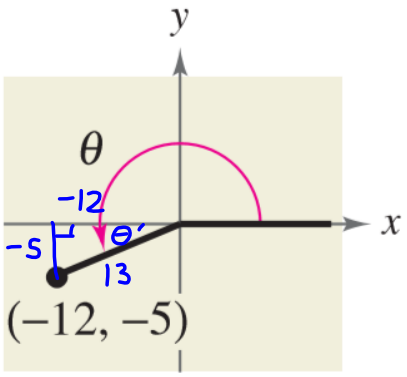


θ = 14π/9 $\theta' = \frac{4\pi}{9}$



Find the exact values of the six trigonometric functions of θ.

(a)

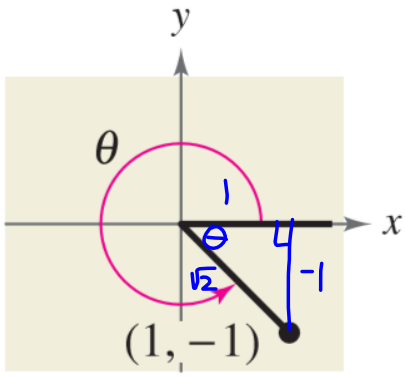


$\sin\theta = -\frac{5}{13}$ $\csc\theta = -\frac{13}{5}$

$\cos\theta = -\frac{12}{13}$ $\sec\theta = -\frac{13}{12}$

$\tan\theta = \frac{-5}{-12} = \frac{5}{12}$ $\cot\theta = \frac{12}{5}$

(b)



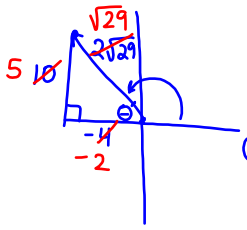
$\sin\theta = \frac{-1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}$ $\csc\theta = -\sqrt{2}$

$\cos\theta = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\sec\theta = \sqrt{2}$

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

The point is on the terminal side of an angle in standard position. Determine the exact value of the six trigonometric functions of the angle.

(-4, 10)



$\sin\theta = \frac{10}{2\sqrt{29}} = \frac{5}{\sqrt{29}} = \frac{5\sqrt{29}}{29}$

$\csc\theta = \frac{\sqrt{29}}{5}$

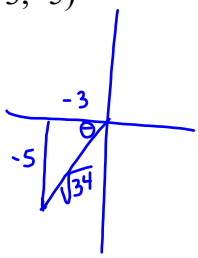
$\cos\theta = \frac{-4}{2\sqrt{29}} = \frac{-2}{\sqrt{29}} = \frac{-2\sqrt{29}}{29}$

$\sec\theta = \frac{\sqrt{29}}{-2} = \frac{-\sqrt{29}}{2}$

$\tan\theta = \frac{10}{-4} = \frac{-5}{2}$

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

(-3, -5)



$\sin\theta = \frac{-5}{\sqrt{34}} = \frac{-5\sqrt{34}}{34}$

$\csc\theta = \frac{-\sqrt{34}}{5}$

$\cos\theta = \frac{-3}{\sqrt{34}} = \frac{-3\sqrt{34}}{34}$

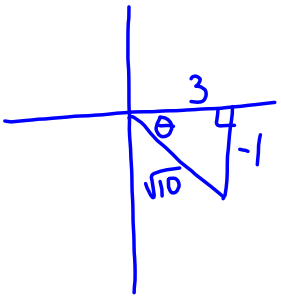
$\sec\theta = \frac{-\sqrt{34}}{3}$

$\tan\theta = 5/3$ $\quad \cot\theta = \frac{3}{5}$

Find the exact values of the remaining trigonometric functions of θ satisfying the given conditions.

II & IV $\quad$ adj/opp $\quad$ & IV

$\cot\theta = \frac{-3}{1}$ and $\cos\theta > 0$



$\sin\theta = \frac{-1}{\sqrt{10}} = \frac{-\sqrt{10}}{10}$ $\quad \csc\theta = -\sqrt{10}$

$\cos\theta = \frac{3}{\sqrt{10}} = \frac{3\sqrt{10}}{10}$ $\quad \sec\theta = \frac{\sqrt{10}}{3}$

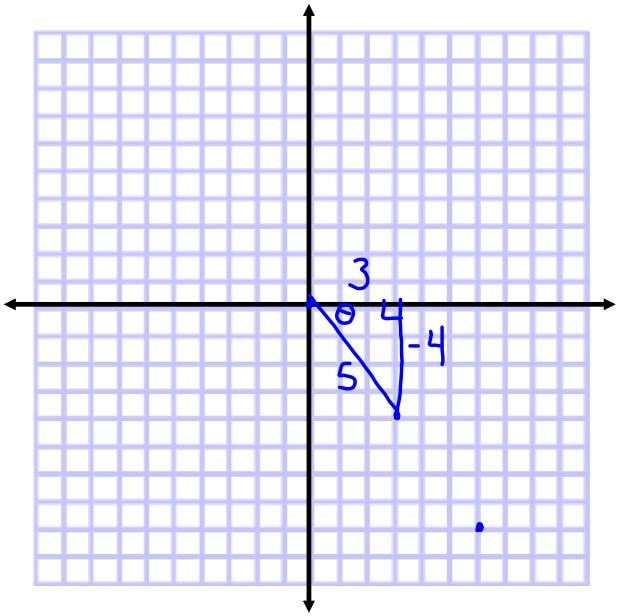
$\tan\theta = \frac{-1}{3}$ $\quad \cot\theta = -3$

The terminal side of θ lies on the given line in the specified quadrant. Find the exact values of the six trigonometric functions of θ by finding a point on the line.

$4x + 3y = 0$ and Quad IV

$3y = -4x$

$y = -\frac{4}{3}x$



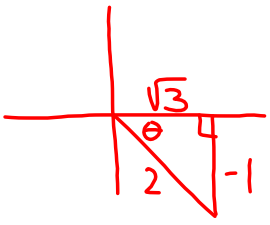
$\sin\theta = -\frac{4}{5}$ $\quad \csc\theta = -\frac{5}{4}$

$\cos\theta = \frac{3}{5}$ $\quad \sec\theta = \frac{5}{3}$

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

Use the function value to find the indicated trigonometric value in the specified quadrant.

$\csc\theta = -2$ in quad IV Find: $\cot\theta = \frac{\sqrt{3}}{-1} = -\sqrt{3}$



Section 4.4 Pgs. 294-296: #11, 15, 17, 19-23, 25, 33-89 odd, 95, 97, 98, 101, 102