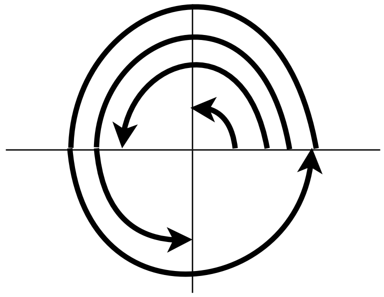
Homework
pg. 536: 11–103eoo, 117a

Math 4 Pre-Calculus
Lecture 16, Part 1

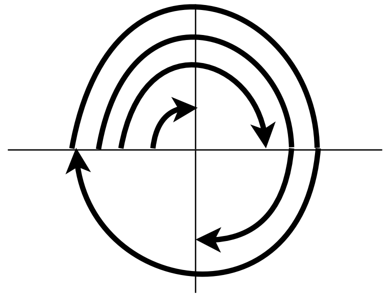
Trigonometric Functions Values — 7.3 & 7.4

Quadrantal Angles:

θ is a quadrantal angle if it's terminal side is on one of the axes. Some are illustrated below:



Examples of Positive quadrantal angles
(90º, 180º, 270º, 360º)

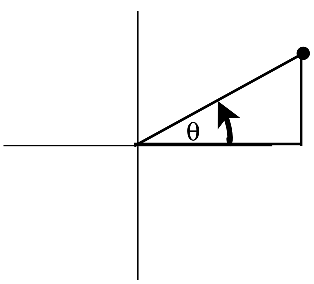


Examples of Negative quadrantal angles
(-90º, -180º, -270º, -360º)

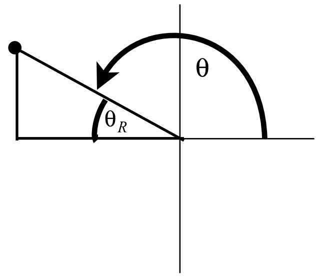
Reference Angle

Let θ be a nonquadrantal angle in standard position. The reference angle for θ is the acute angle θ_R that the terminal side of θ makes with the *x*-axis.

The reference angles are illustrated below for positive angles.

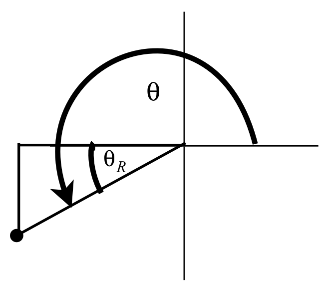


Quadrant I
$\theta_R = \theta$



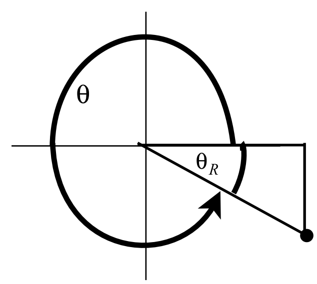
Quadrant II
$\theta_R = 180° - \theta$

$\theta_R = \pi - \theta$



Quadrant III
$\theta_R = \theta - 180°$

$\theta_R = \theta - \pi$



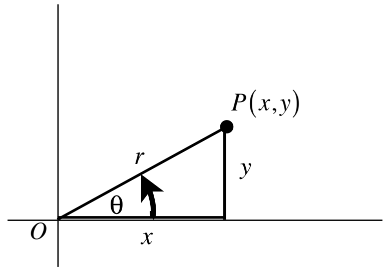
Quadrant IV
$\theta_R = 360° - \theta$

$\theta_R = 2\pi - \theta$

1. *Find the reference angle* θ_R if θ *has the given measure.*
   a) $\theta = 165°$
   b) $\theta = \dfrac{5\pi}{3}$
   c) $\theta = -315°$
   d) $\theta = -\dfrac{9\pi}{4}$

Trigonometric Functions for Any Angle

Consider an acute angle θ , in standard position. Let r denote the distance between the origin and a point $P(x, y)$ that is on the terminal side of θ . The following pictures illustrate this:



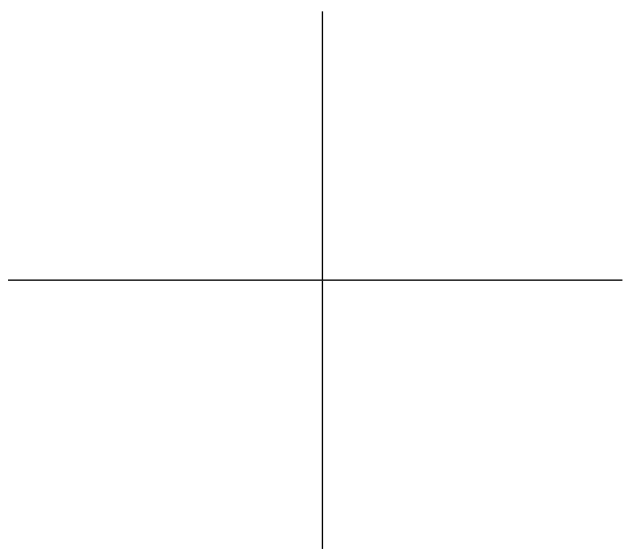
Let θ be an angle in standard position on a rectangular coordinate system, and let $P(x, y)$ be any point other than the origin on the terminal side of θ . If $d(O, P) = r = \sqrt{x^2 + y^2}$ (note that r is always positive), then,

$\sin\theta = \frac{y}{r}$ $\qquad$ $\cos\theta = \frac{x}{r}$ $\qquad$ $\tan\theta = \frac{y}{x}$, if $x \neq 0$

$\csc\theta = \frac{r}{y}$, if $y \neq 0$ $\qquad$ $\sec\theta = \frac{r}{x}$, if $x \neq 0$ $\qquad$ $\cot\theta = \frac{x}{y}$, if $y \neq 0$

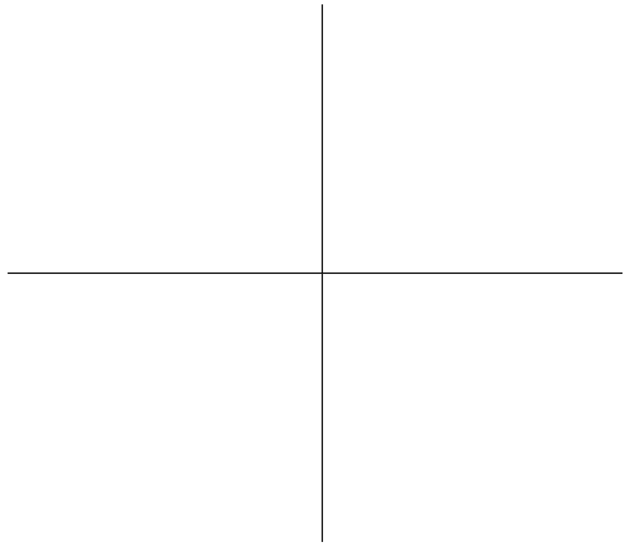
NOTE: When $r = 1$, then $\sin\theta = y$ and $\cos\theta = x$

2. *Find the exact values of the six trigonometric functions of* θ *if* θ *is in standard position and* P *is on the terminal side.* $P(-8, -15)$



3. *Find the exact values of sine, cosine and tangent of each angle whenever possible. Use* $r = 1$.

a) $0°$ or 0



b) $90°$ or $\frac{\pi}{2}$

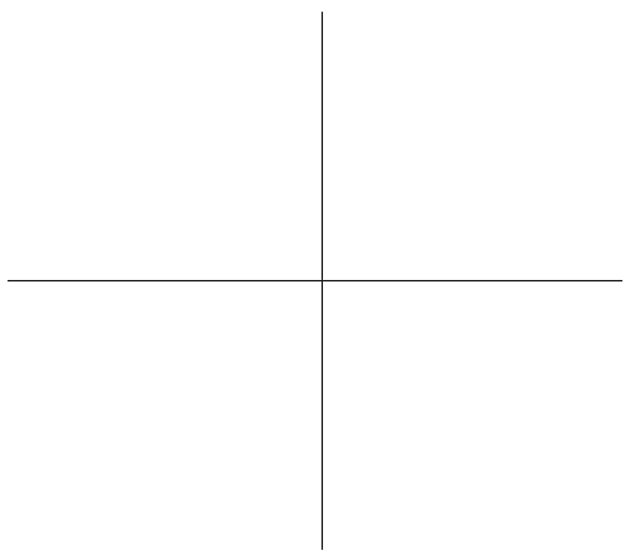
c) $180°$ or π

d) $270°$ or $\frac{3\pi}{2}$

e) $360°$ or 2π

4. *Find the exact values of sine, cosine and tangent of each angle whenever possible. Use* $r = 1$.

a) $45°$ or $\frac{\pi}{4}$



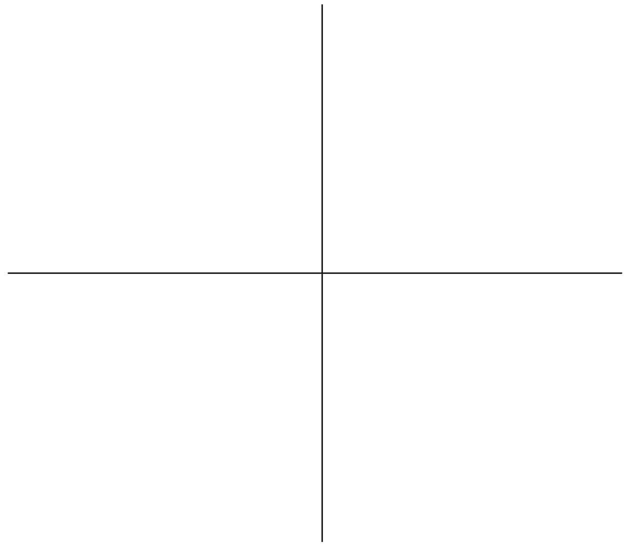
b) $135°$ or $\frac{3\pi}{4}$

c) $225°$ or $\frac{5\pi}{4}$

d) $315°$ or $\frac{7\pi}{4}$

Find the exact values of sine, cosine and tangent of each angle whenever possible. Use $r = 1$.

5. a) $30°$ or $\frac{\pi}{6}$



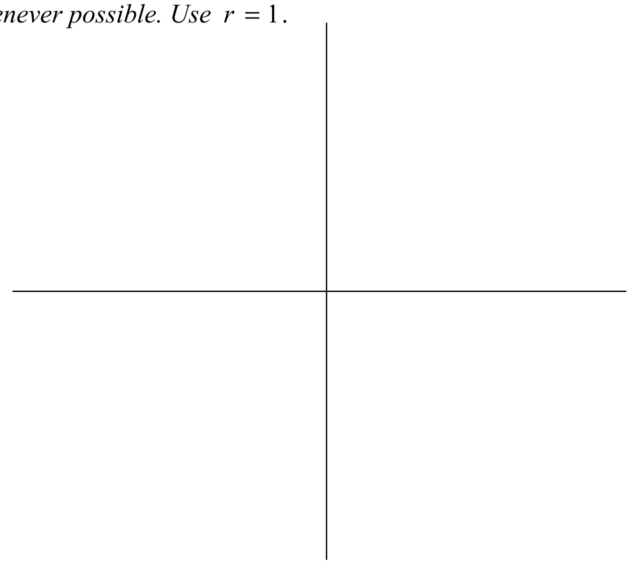
b) $150°$ or $\frac{5\pi}{6}$

c) $210°$ or $\frac{7\pi}{6}$

d) $330°$ or $\frac{11\pi}{6}$

Find the exact values of sine, cosine and tangent of each angle whenever possible. Use $r = 1$.

6. a) $60°$ or $\frac{\pi}{3}$



b) $120°$ or $\frac{2\pi}{3}$

c) $240°$ or $\frac{4\pi}{3}$

d) $300°$ or $\frac{5\pi}{3}$

Theorem on Reference Angles

If θ is a nonquadrantal angle in standard position, then to find the value of a trigonometric function at θ, find its value for the reference angle θ_R and prefix the appropriate sign.

Positive Trigonometric Functions

Quadrant II Sine Cosecant Smart	*Quadrant I* All A
Quadrant III Tangent Cotangent Trig	*Quadrant IV* Cosine Secant Class

7. *Find the exact value.*

a) $\sin(-120°)$

b) $\sec\left(\frac{2\pi}{3}\right)$

c) $\cot\left(-\frac{3\pi}{4}\right)$

d) $\csc(-30°)$

8. *Use the fundamental identities to find the values of the trigonometric functions for the given conditions.*

$\cot\theta = \frac{3}{4}$ and $\cos\theta < 0$

9. *Use the fundamental identities to find the values of the trigonometric functions for the given conditions.*

$\cos\theta = -\frac{1}{3}$ and $\sin\theta < 0$

10. *Use a CALCULATOR to approximate to three decimal places.*

a) $\cos(2.5)$

b) $\csc(185°12'44'')$

11. *Use a CALCULATOR to approximate the acute angle* θ *to the nearest (a)* $0.01°$ *and (b)* $1'$.

a) $\sin\theta = 0.8$

b) $\sec\theta = 5$

12. *Use a CALCULATOR to approximate to the nearest* $0.1°$ *all angles* θ *in the interval* $[0°, 360°)$ *that satisfy the equation.*

a) $\sin\theta = 0.8$

b) $\tan\theta = -1.5214$

13. *Use a CALCULATOR to approximate to the nearest* 0.01 *radians all angles* θ *in the interval* $[0, 2\pi)$ *that satisfy the equation.*

a) $\cos\theta = 0.9235$

b) $\csc\theta = 1.258$