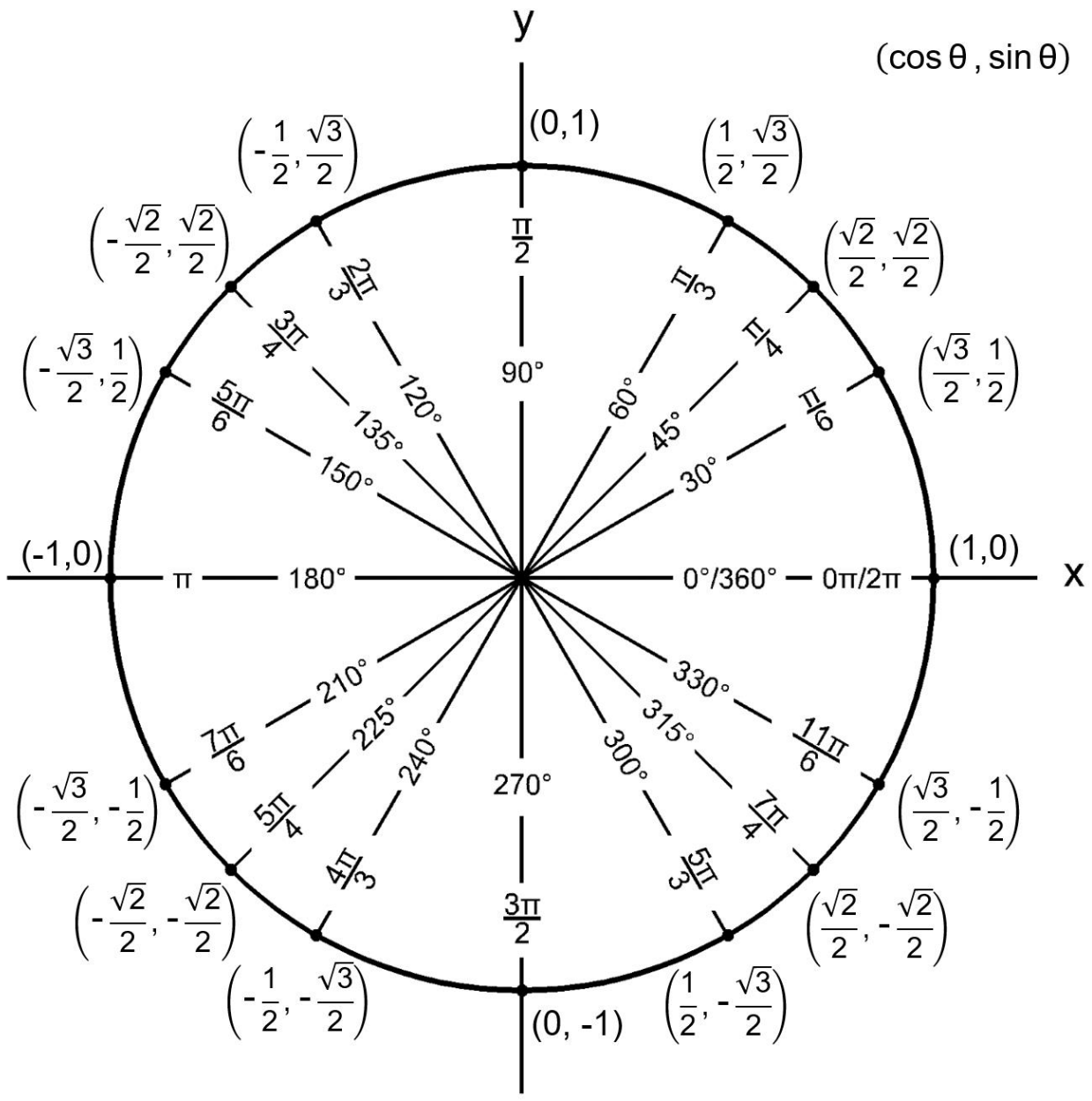
STUDENT SUCCESS CENTER
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

TRIGONOMETRY REVIEW

Unit Circle:



Trigonometric Identities:

- **Reciprocal**
  - $\sin\theta = \frac{1}{\csc\theta}$
  - $\tan\theta = \frac{1}{\cot\theta}$
  - $\csc\theta = \frac{1}{\sin\theta}$
  - $\cos\theta = \frac{1}{\sec\theta}$
  - $\cot\theta = \frac{1}{\tan\theta}$
  - $\sec\theta = \frac{1}{\cos\theta}$
- **Pythagorean**
  - $\sin^2\theta + \cos^2\theta = 1$
  - $\tan^2\theta + 1 = \sec^2\theta$
  - $1 + \cot^2\theta = \csc^2\theta$
- **Double Angle**
  - $\sin 2\theta = 2\sin\theta\cos\theta$
  - $\cos 2\theta = \cos^2\theta - \sin^2\theta$
  - $= 2\cos^2\theta - 1$
  - $= 1 - 2\sin^2\theta$
  - $\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$
- **Sum-to-Product**
  - $\sin u + \sin v = 2\sin\left(\frac{u+v}{2}\right)\cos\left(\frac{u-v}{2}\right)$
  - $\sin u - \sin v = 2\cos\left(\frac{u+v}{2}\right)\sin\left(\frac{u-v}{2}\right)$
  - $\cos u + \cos v = 2\cos\left(\frac{u+v}{2}\right)\cos\left(\frac{u-v}{2}\right)$
  - $\cos u - \cos v = -2\sin\left(\frac{u+v}{2}\right)\sin\left(\frac{u-v}{2}\right)$
- **Even and Odd Functions**
  - $\sin(-\theta) = -\sin\theta$
  - $\tan(-\theta) = -\tan\theta$
  - $\sec(-\theta) = \sec\theta$
  - $\cos(-\theta) = \cos\theta$
  - $\cot(-\theta) = -\cot\theta$
  - $\csc(-\theta) = -\csc\theta$
- **Quotient**
  - $\tan\theta = \frac{\sin\theta}{\cos\theta}$
  - $\cot\theta = \frac{\cos\theta}{\sin\theta}$
- **Sum and Difference**
  - $\sin(u\pm v) = \sin u\cos v \pm \cos u\sin v$
  - $\cos(u\pm v) = \cos u\cos v \mp \sin u\sin v$
  - $\tan(u\pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u\tan v}$
- **Half Angle**
  - $\sin^2\theta = \frac{1 - \cos 2\theta}{2}$
  - $\cos^2\theta = \frac{1 + \cos 2\theta}{2}$
  - $\tan^2\theta = \frac{1 - \cos 2\theta}{1 + \cos 2\theta}$
- **Product to Sum**
  - $\sin u\sin v = \frac{1}{2}[\cos(u - v) - \cos(u + v)]$
  - $\cos u\cos v = \frac{1}{2}[\cos(u - v) + \cos(u + v)]$
  - $\sin u\cos v = \frac{1}{2}[\sin(u + v) + \sin(u - v)]$
  - $\cos u\sin v = \frac{1}{2}[\sin(u + v) - \sin(u - v)]$

Inverse Trigonometric Functions:

• Function	• Domain	• Range
$\sin^{-1}\theta = \arcsin\theta$	$[-1,1]$	$\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$
$\cos^{-1}\theta = \arccos\theta$	$[-1,1]$	$[0,\pi]$
$\tan^{-1}\theta = \arctan\theta$	$(-\infty,\infty)$	$\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$
$\cot^{-1}\theta = \operatorname{arccot}\theta$	$(-\infty,\infty)$	$\left[-\frac{\pi}{2},0\right) \cup \left(0,\frac{\pi}{2}\right]$
$\sec^{-1}\theta = \operatorname{arcsec}\theta$	$(-\infty,-1] \cup [1,\infty)$	$\left[0,\frac{\pi}{2}\right) \cup \left(\frac{\pi}{2},\pi\right]$
$\csc^{-1}\theta = \operatorname{arccsc}\theta$	$(-\infty,-1] \cup [1,\infty)$	$\left[-\frac{\pi}{2},0\right) \cup \left(0,\frac{\pi}{2}\right]$

For more information, visit a tutor. All appointments are available in-person at the Student Success Center, located in the Library, or online. Hass, J., Weir, M.D., & Thomas, G.B. (2012). *University Calculus: Early Transcendentals* (2nd ed.). Boston: Pearson Education.