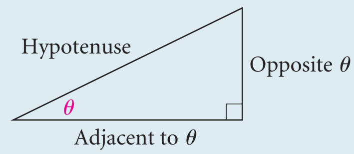
Chapter 5 Summary and Review

Important Properties and Formulas

Trigonometric Function Values of an Acute Angle θ

Let θ be an acute angle of a right triangle. The six trigonometric functions of θ are as follows:



$$\sin\theta = \frac{\text{opp}}{\text{hyp}}, \quad \cos\theta = \frac{\text{adj}}{\text{hyp}}, \quad \tan\theta = \frac{\text{opp}}{\text{adj}},$$

$$\csc\theta = \frac{\text{hyp}}{\text{opp}}, \quad \sec\theta = \frac{\text{hyp}}{\text{adj}}, \quad \cot\theta = \frac{\text{adj}}{\text{opp}}.$$

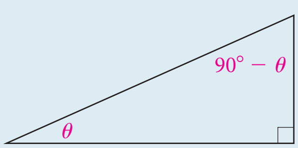
Reciprocal Functions

$$\csc\theta = \frac{1}{\sin\theta}, \quad \sec\theta = \frac{1}{\cos\theta}, \quad \cot\theta = \frac{1}{\tan\theta}$$

Function Values of Special Angles

	0°	30°	45°	60°	90°
sin	0	$1/2$	$\sqrt{2}/2$	$\sqrt{3}/2$	1
cos	1	$\sqrt{3}/2$	$\sqrt{2}/2$	$1/2$	0
tan	0	$\sqrt{3}/3$	1	$\sqrt{3}$	Not defined

Cofunction Identities



$\sin\theta = \cos(90° - \theta)$, $\cos\theta = \sin(90° - \theta)$,
$\tan\theta = \cot(90° - \theta)$, $\cot\theta = \tan(90° - \theta)$,
$\sec\theta = \csc(90° - \theta)$, $\csc\theta = \sec(90° - \theta)$

(*continued*)

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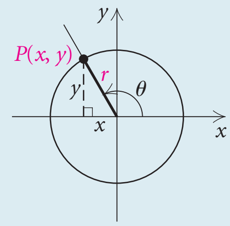
Trigonometric Functions of Any Angle θ

If $P(x, y)$ is any point on the terminal side of any angle θ in standard position, and r is the distance from the origin to $P(x, y)$, where $r = \sqrt{x^2 + y^2}$, then

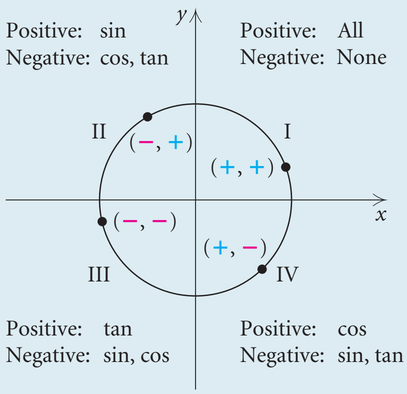


$$\sin \theta = \frac{y}{r}, \quad \cos \theta = \frac{x}{r}, \quad \tan \theta = \frac{y}{x},$$

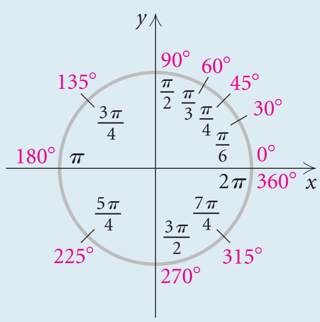
$$\csc \theta = \frac{r}{y}, \quad \sec \theta = \frac{r}{x}, \quad \cot \theta = \frac{x}{y}.$$

Signs of Function Values

The signs of the function values depend only on the coordinates of the point P on the terminal side of an angle.



Radian–Degree Equivalents

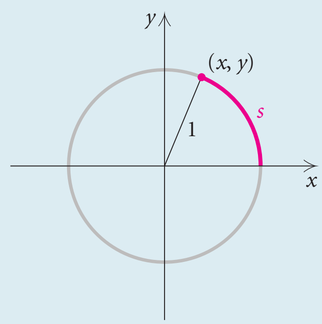


Linear Speed in Terms of Angular Speed

$$v = r\omega$$

Basic Circular Functions

For a real number s that determines a point (x, y) on the unit circle:



$$\sin s = y,$$
$$\cos s = x,$$
$$\tan s = \frac{y}{x}.$$

Sine is an odd function: $\sin(-s) = -\sin s$.

Cosine is an even function: $\cos(-s) = \cos s$.

Transformations of Sine and Cosine Functions

To graph $y = A \sin(Bx - C) + D$ and $y = A \cos(Bx - C) + D$:

1. Stretch or shrink the graph horizontally according to B. $\left(\text{Period} = \left|\frac{2\pi}{B}\right|\right)$
2. Stretch or shrink the graph vertically according to A. (Amplitude $= |A|$)
3. Translate the graph horizontally according to C/B. $\left(\text{Phase shift} = \frac{C}{B}\right)$
4. Translate the graph vertically according to D.

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