

Course Review

Chapter 5 - Trigonometric Functions

5-1 Angles and their Measure

Standard position angles: initial side on positive x-axis; terminal side rotates counter-clockwise

Radians to Degrees: radians $\cdot \frac{180^\circ}{\pi}$ Degrees to Radians: degrees $\cdot \frac{\pi}{180^\circ}$

Degrees, Minutes, and Seconds: 1 degree = 60 minutes; 1 minutes = 60 seconds

Arc Length: $a = r \cdot \theta$ (where $a =$ arc length; $r =$ radius; $\theta =$ angle measured in radians)

Sector Area: $s = \frac{1}{2} r^2 \cdot \theta$ (where $s =$ sector area; $r =$ radius; $\theta =$ angle measured in radians)

Circular Motion: $\omega = \frac{\theta}{t}$ (where $\omega =$ angular speed; $\theta =$ angle measured in radians; $t =$ time)

Linear and Angular Speed: $V = r \cdot \omega$ (where $V =$ linear speed; $r =$ radius; $\omega =$ angular speed)

5-2 Trig Functions and Unit Circle

$$\sin(\theta) = \frac{y}{r}; \quad \cos(\theta) = \frac{x}{r}; \quad \tan(\theta) = \frac{y}{x}; \quad \csc(\theta) = \frac{r}{y}; \quad \sec(\theta) = \frac{r}{x}; \quad \cot(\theta) = \frac{x}{y}$$

Quadrant Signs (*Save All The Children*):

Q1: all positive Q2: sin/csc positive; Q3: tan/cot positive; Q4: cos/sec positive

Reference Angles by Quadrant:

Q1: $Ar = A$; Q2: $Ar = 180^\circ - A$; Q3: $Ar = A - 180^\circ$; Q4: $Ar = 360^\circ - A$

Coterminal Angles : Angles with the same terminal side. (*And measure difference is a multiple of 360° or 2π*)

Quadrantal Angles: 0° or 0 90° or $\pi/2$ 180° or π 270° or $3\pi/2$ 360° or 2π

Finding Trig Functions on Coordinate Plane

Step 1: Draw the angle

Step 2: Draw the reference angle

Step 3: Label the sides (with values, if known, or with variables)

Step 4: Find the missing values

Step 5: Find values of trig functions based on relationships of sides

Finding Trig Functions when Given an Angle

- Step 1: Draw the angle in standard position
- Step 2: Draw the reference angle
- Step 3: Label all known angles and sides
- Step 4: Find missing values
- Step 5: Find values of trig functions based on relationships of sides

Finding Trig Functions Given Another Trig Function

- Step 1: Draw the terminal side of the angle in the correct quadrant, based on signs
- Step 2: Draw reference angle
- Step 3: Calculate missing side, if necessary
- Step 4: Find values of trig functions based on relationships of sides

Unit Circle: A circle with radius =1 and centered at the origin (0,0) of the Cartesian coordinate system.

Important Angles:	angle	sin	cos	tan
	$\pi/6$	1/2	$\sqrt{3}/2$	$\sqrt{3}/3$
	$\pi/4$	$\sqrt{2}/2$	$\sqrt{2}/2$	1
	$\pi/3$	$\sqrt{3}/2$	1/2	$\sqrt{3}$

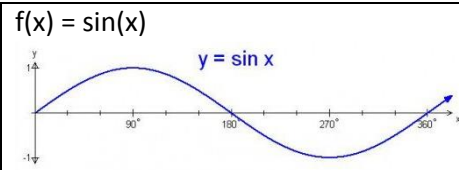
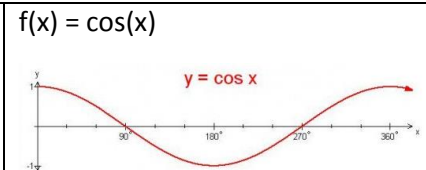
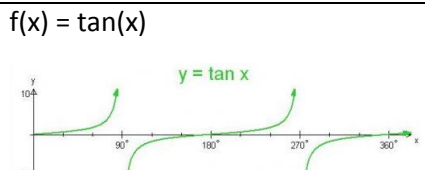
How to remember: 1) 1-2-3, 3-2-1; 2) square roots 3) divide by 2 4) reflections

5-3 Properties of Trig Functions

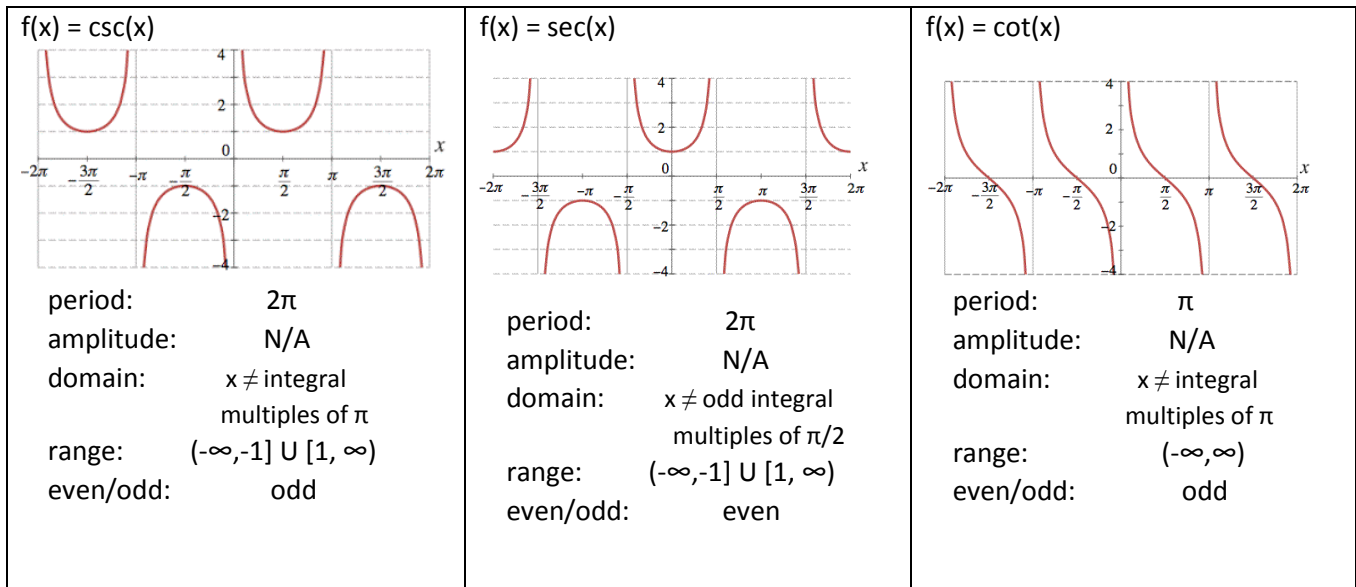
- Reciprocal Identities: $\sin(x) = 1/\csc(x)$; $\cos(x) = 1/\sec(x)$; $\tan(x) = 1/\cot(x)$
 Quotient Identities: $\tan(x) = \sin(x)/\cos(x)$; $\cot(x) = \cos(x)/\sin(x)$
 Pythagorean Identities $\sin^2\theta + \cos^2\theta = 1$; $\tan^2\theta + 1 = \sec^2\theta$; $1 + \cot^2\theta = \csc^2\theta$;

Pythagorean Identities Method: $x^2 + y^2 = r^2$; Divide each term by x^2 , y^2 , and r^2 to get the identities

5-4 Graphs of Sine and Cosine

$f(x) = \sin(x)$	$f(x) = \cos(x)$	$f(x) = \tan(x)$
		
period: 2π amplitude: 1 domain: $(-\infty, \infty)$ range: $[-1, 1]$ even/odd: odd	period: 2π amplitude: 1 domain: $(-\infty, \infty)$ range: $[-1, 1]$ even/odd: even	period: π amplitude: N/A domain: $x \neq$ odd integral multiples of $\pi/2$ range: $(-\infty, \infty)$ even/odd: odd

5-5 Graphs of Tan, Cot, Csc, Sec



5-6 Phase Shifts and Sinusoidal Curves: $f(x) = (a)\sin(bx+c) + d$

a = amplitude (sin, cos) or vertical stretch (csc, sec, tan, cot)

$\frac{2\pi}{b}$ = new period (sin, cos, csc, sec) or $\frac{\pi}{b}$ = new period (tan, cot)

$\frac{\pi}{2b}$ = horizontal increment of important values

c = horizontal shift (if factored) or $\frac{c}{b}$ (if not factored)

d = vertical shift

NOTE: If factored $y = A\sin[B(x-C)] + D$, then $(C,D) = (h,k)$ = new origin of function