Homework grades this week:

01: **Read** sections 5.3 and 5.4 in your textbook (and 5.2 if you haven't already) **by Monday** 22 Aug.

02: Complete at least 45 minutes of exercises on **Khan Academy** related to sections 5.2, 5.3, and 5.4 **by Friday**, 26 Aug; in addition, complete "Mastery Challenges" as often as they become available to you.

03: **Textbook problems**, mostly be completed in class and due **Friday, 26 Aug**.
- 5.2: #1-6 all; 15-41 odd; 59-75 odd (NO CALCULATOR!)
- 5.3: #1-35 odd; 37-48 all (NO CALCULATOR!); 61-68 all (NO CALCULATOR!)
- 5.4: #13-22 all (NO CALCULATOR!)

Expect a **quiz** sometime this week on some combination of radians & degrees, arc length & angular speed, trigonometric functions, 30-60-90 & 45-45-90 triangles.

Khan Academy exercises for section 5.1:

arc measure

arc length

radians & degrees

radians & arc length

complementary & supplementary angles

multiple units word problems

convert units (metrics)

convert units word problems (metrics)

convert units (US customary)

convert units word problems (US customary)

Khan Academy exercises for section 5.2:
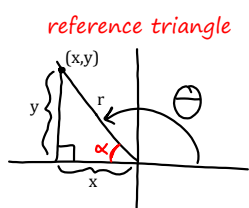
Trigonometric ratios in right triangles

Solve for a side in right triangles

Solve for an angle in right triangles

Right triangle word problems

Khan Academy exercises for section 5.3-5.4:

Trig values of special angles

Use the Pythagorean identity

5.3 - Trigonometric Functions of Any Angle

For an angle in standard position, the reference angle is the acute angle between the terminal side of the angle and the x-axis.

reference triangle

(x,y)

$$\sin \theta = \frac{y}{r}$$

$$\cos \theta = \frac{x}{r}$$

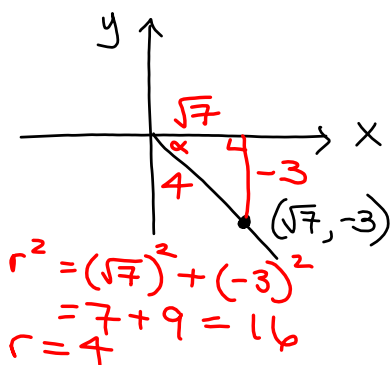$$\tan \theta = \frac{y}{x}$$

(+,+)

I

III (-,-)

(-,+)

II

IV (+,-)

* note that the hypotenuse r is always positive, so that the x- and y-coordinates determine whether the trig function is positive or negative

II   **I**
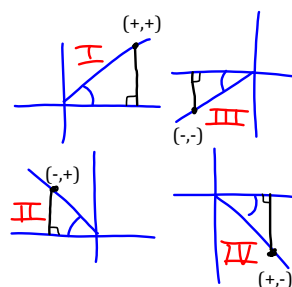
Students   **A**ll
only sine (and its reciprocal)   all functions are positive

Take   **C**alculus
only tan (and its reciprocal)   only cosine (and its reciprocal)

III   **IV**

Tells us which functions are positive in which quadrants.

Find the 6 trigonometric function values of an angle whose terminal side passes through the given point.
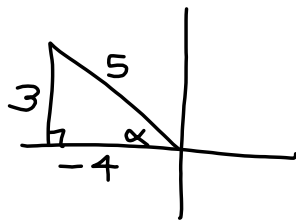
y

$\sqrt{7}$

α 4

-3

$(\sqrt{7}, -3)$

$r^2 = (\sqrt{7})^2 + (-3)^2$
$= 7 + 9 = 16$
$r = 4$

$csc\,\alpha = -\dfrac{4}{3}$

$tan\,\alpha = -\dfrac{3}{\sqrt{7}}$

$cos\,\alpha = \dfrac{\sqrt{7}}{4}$

3

36. Given that $\cos \alpha = -\dfrac{4}{5}$ and $\alpha \in QII$,
find the other 5 trigonometric function values of α.

$$\cot \alpha = \frac{-4}{3}$$

$$\csc \alpha = \frac{5}{3}$$

$$\sec \alpha = -\frac{5}{4}$$

$$\tan \alpha = -\frac{3}{4}$$

Pythagorean
Triples

3-4-5
5-12-13
. . .

$$\sin \alpha = \frac{3}{5}$$

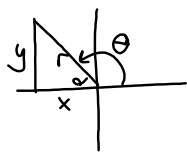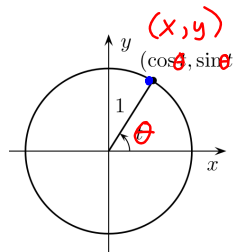The unit circle and function values of 30°, 45°, and 60° reference angles

unit circle:
radius r=1 $X^2 + y^2 = 1$
center (0,0)

$(x-h)^2 + (y-k)^2 = r^2$
center: (h,k) ; radius: r
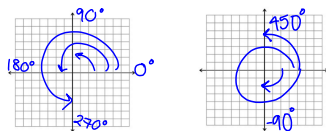
(x,y)
$(\cos\theta, \sin\theta)$

1

θ

$$\sin\theta = \frac{y}{r} \qquad y = r\sin\theta$$

$$\cos\theta = \frac{x}{r} \qquad x = r\cos\theta$$

What about quadrantal angles?

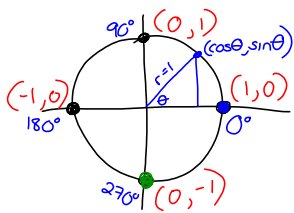An angle whose terminal side falls on an axis is called a <u>quadrantal angle</u>.

$$\frac{opp}{adj} = \frac{\frac{opp}{hyp}}{\frac{adj}{hyp}}$$

Reciprocal Identities

$$\csc x = \frac{1}{\sin x} \quad , \quad \sin x = \frac{1}{\csc x}$$

$$\sec x = \frac{1}{\cos x} \quad , \quad \cos x = \frac{1}{\sec x}$$

$$\cot x = \frac{1}{\tan x} \quad , \quad \tan x = \frac{1}{\cot x}$$

Ratio Identities

$$\tan x = \frac{\sin x}{\cos x} \quad , \quad \cot x = \frac{\cos x}{\sin x}$$

$$\tan 0° = \frac{0}{1} = \boxed{0}$$

$$\sec 270° = \frac{1}{0} \boxed{undefined}$$

The Unit Circle

$$\frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$$

Common angles:
(memorize!)

$$\frac{\pi}{6} = 30°$$

$$\frac{\pi}{4} = 45°$$

$$\frac{\pi}{3} = 60°$$
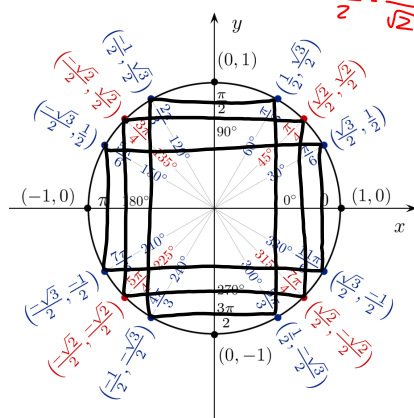
Note:

$$\frac{k\pi}{6} \to 30° \; ref. \angle$$

$$\frac{k\pi}{4} \to 45° \; ref. \angle$$

$$\frac{k\pi}{3} \to 60° \; ref. \angle$$

$$\frac{k\pi}{2} \to 90° \; or \; 270°$$

$$k\pi \to 0° \; for \; k \; even;$$
$$180° \; for \; k \; odd$$

Find the trig function value of the given angle (note that they all have either a 30°, 45°, or 60° reference angle OR are quadrantal angles).
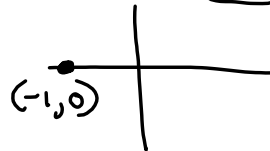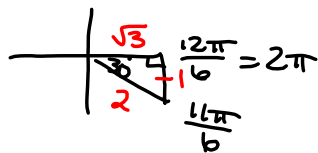
$$\tan 300° = \boxed{-\sqrt{3}} \qquad \sec(-135°) = \boxed{-\sqrt{2}}$$
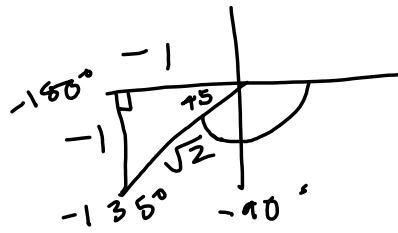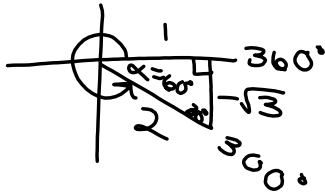
Evaluate the trigonometric function of an angle given in radians

$$\cos \frac{11\pi}{6} = \frac{\sqrt{3}}{2} \qquad \sin 329\pi = \boxed{0}$$

$$\tan \frac{7\pi}{2} = \frac{-1}{0} \; \text{undefined} \qquad \sec \frac{5\pi}{6} =$$