Today's Plan:

Learning Target (standard): I will solve trigonometric equations.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.
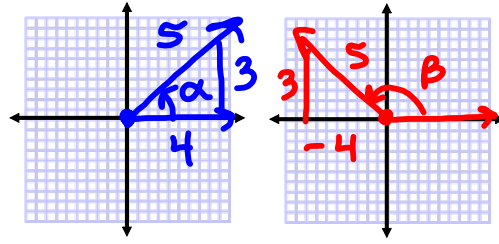

Find the exact value of each expression:

$$\cos^{-1}\left(\cos\left(-\frac{3\pi}{4}\right)\right)$$

$$= \cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$$

$$= \frac{3\pi}{4}$$
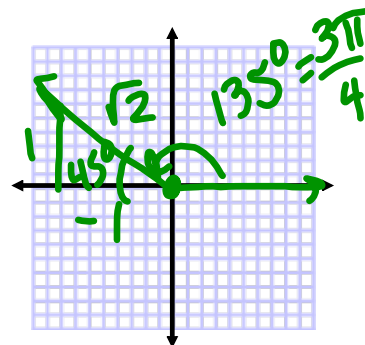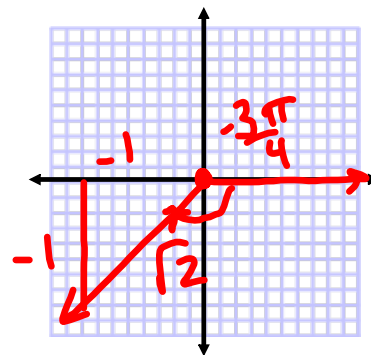
Find the exact value of each expression:

$$\sin\left[\sin^{-1}\frac{3}{5} - \cos^{-1}\left(-\frac{4}{5}\right)\right]$$

$$= \sin(\alpha - \beta)$$

$$= \sin\alpha\cos\beta - \cos\alpha\sin\beta$$

$$= \left(\frac{3}{5}\right)\left(-\frac{4}{5}\right) - \left(\frac{4}{5}\right)\left(\frac{3}{5}\right)$$

$$= \frac{-12}{25} - \frac{12}{25}$$

$$= \frac{-24}{25}$$

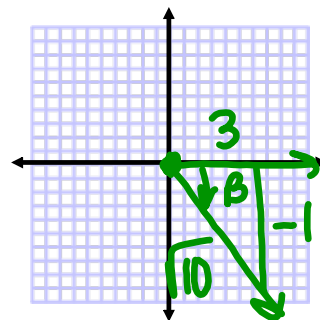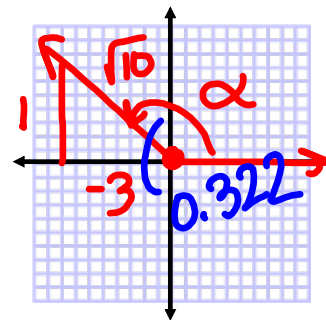Use a calculator to evaluate the expression:

$$\cot^{-1}(-3)$$

$$= \tan^{-1}\left(-\frac{1}{3}\right)$$

$$= -0.322$$

$$\cot^{-1}(-3) = \pi - 0.322$$

$$= 2.820$$

$$\beta = -0.322$$

Trigonometric Equations:

- Find the solutions over an interval whose length equals the period of the function.
  - > All solutions repeat every 2π

- Add multiples of that period to each solution.
  - > Vertical and/or horizontal stretches and compressions affect the final solutions.
  - > Solve for θ on the given interval.

* Unless the domain is restricted, we find ALL solutions of the trigonometric equations. *

Solve the equation for $0 \le \theta \le 2\pi.$

$$\sin \theta = \frac{1}{2}$$
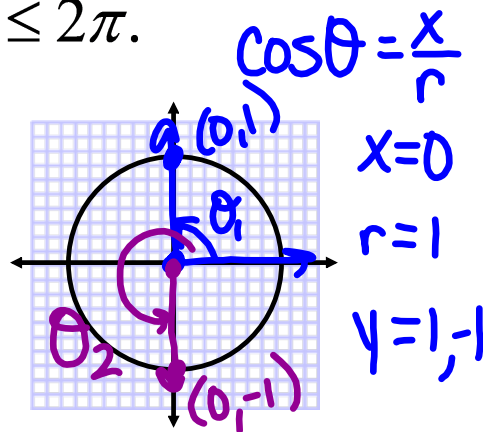
$$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$$

$$\sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$$

Solve the equation for $0 \le \theta \le 2\pi$.

$$\cos\theta = 0$$

$$\theta = \frac{\pi}{2}, \frac{3\pi}{2}$$
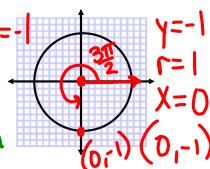
$\cos\theta = \frac{x}{r}$

$x = 0$

$r = 1$

$y = 1, -1$

$(0,1)$

θ_1

θ_2

$(0,-1)$

$$\cos^{-1}(0) = \frac{\pi}{2}$$

Solve the equation for $0 \le \theta \le 2\pi$.

$$\sin 3\theta = -1$$

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

$\sin\alpha = -1$

$y = -1$

$r = 1$

$x = 0$

$\frac{3\pi}{2}$

$(0,1)(0,-1)$

$$3\theta = \frac{3\pi}{2} + 2\pi k$$

$$\theta = \frac{\pi}{2} + \frac{2\pi}{3}k$$

$K = 0$

$$\theta = \frac{\pi}{2} + \frac{2\pi}{3}(0)$$

$$\theta = \frac{\pi}{2}$$

$K = 1$

$$\theta = \frac{\pi}{2} + \frac{2\pi}{3}(1)$$

$$= \frac{\pi}{2} + \frac{2\pi}{3}$$

$$= \frac{3\pi}{6} + \frac{4\pi}{6}$$

$$\theta = \frac{7\pi}{6}$$

$K = 2$

$$\theta = \frac{\pi}{2} + \frac{2\pi}{3}(2)$$

$$= \frac{\pi}{2} + \frac{4\pi}{3}$$

$$= \frac{3\pi}{6} + \frac{8\pi}{6}$$
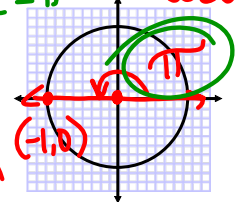
$$\theta = \frac{11\pi}{6}$$

$$\theta = \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

Solve the equation for $0 \le \theta \le 2\pi$.

$$\cos\left(2\theta - \frac{\pi}{2}\right) = -1$$

$2\left(\frac{3\pi}{4}\right) - \frac{\pi}{2} = \frac{3\pi}{2} - \frac{\pi}{2} = \frac{2\pi}{2} = \pi$

$\cos\theta = -1$

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

π

$(-1,0)$

$2\theta - \frac{\pi}{2} = \pi + 2\pi k$

$2\theta = \frac{3\pi}{2} + 2\pi k$

$$\boxed{\theta = \frac{3\pi}{4} + \pi k}$$

$K = 0$
$\theta = \frac{3\pi}{4} + \pi(0)$
$\theta = \frac{3\pi}{4}$

$K = 1$
$\theta = \frac{3\pi}{4} + \pi(1)$
$= \frac{3\pi + 4\pi}{4}$
$\theta = \frac{7\pi}{4}$

$K = 2$
$\theta = \frac{3\pi}{4} + \pi(2)$
$= \frac{3\pi}{4} + \frac{8\pi}{4}$
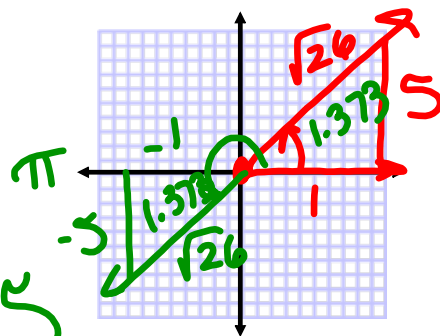$\theta = \frac{11\pi}{4} > 2\pi$

$$\theta = \frac{3\pi}{4}, \frac{7\pi}{4}$$

Solve the equation for $0 \le \theta \le 2\pi$.

$$\tan\theta = 5$$

$\theta = \tan^{-1}(5)$

$\theta = 1.373, 4.515$

$\sqrt{26}$
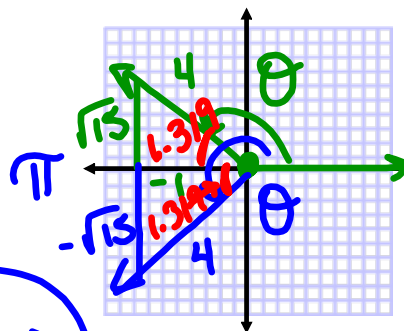1.373
5

π
-1
-5
1.373
$\sqrt{26}$
1

$\theta = \pi + 1.373$

Solve the equation for $0 \le \theta \le 2\pi$.

$$\sec \theta = -4 = \frac{r}{x}$$

$$\sec^{-1}(-4) = \cos^{-1}\left(-\frac{1}{4}\right)$$

$$\theta = 1.823, 4.460$$

$$\theta = \pi + 1.319$$

Assignment:

p.510 #2-24 even

* Be sure to draw all diagrams. *