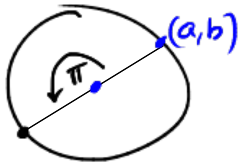
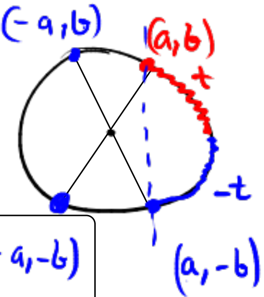
WeBWork Questions?



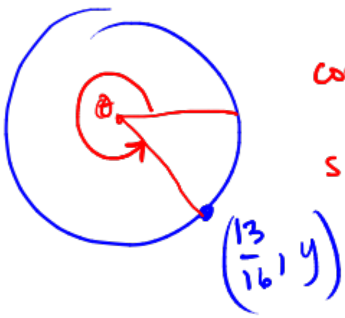
$\pi + (a,b)$ really $(-a,-b)$

$\pi - t$ ← First find $-t$ →



$\boxed{\pi + t \leftrightarrow (-a,-b)}$

5.1.4



$\cos(\theta) = \frac{13}{16}$

$\sin\theta = y$

$\cos^2\theta + \sin^2\theta = 1$

$\frac{169}{256} + \sin^2\theta = 1$

$\sin^2\theta = 1 - \frac{169}{256} = \frac{87}{256}$

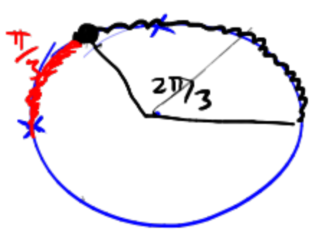
$\sin\theta = \pm\sqrt{\frac{87}{256}}$

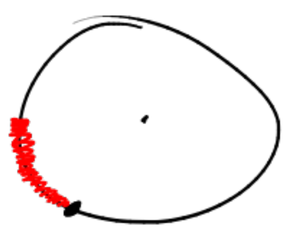
$\boxed{\text{IV} \Rightarrow \text{choose negative}}$

5.1.3

Reference #

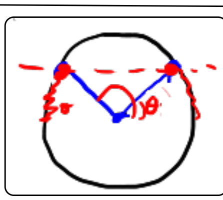
$\frac{2\pi}{3} = \frac{2}{3} \times \pi$





5.2.11

quadratic-type



just like: $\boxed{w = \sin x} \rightarrow$ $\underbrace{3w^2 - 7w + 2}\ = 0$

$(3w - 1)(w - 2) = 0$

$3w = 1$ or $w = 2$

$3\sin^2 x - 7\sin x + 2 = 0$

"asin"

$x = \sin^{-1}\left(\frac{1}{3}\right)$ & $x = \sin^{-1}(2)$

$\boxed{\sin x = w = \frac{1}{3}}$ or $w = 2$

$\boxed{\sin x = 2}$

$$2(\sin x)^2 - 5\cos x - 4 = 0$$

$$\sin^2 x + \cos^2 x = 1$$

$$\sin^2 x = 1 - \cos^2 x$$

$$2(1 - \cos^2 x) - 5\cos x - 4$$

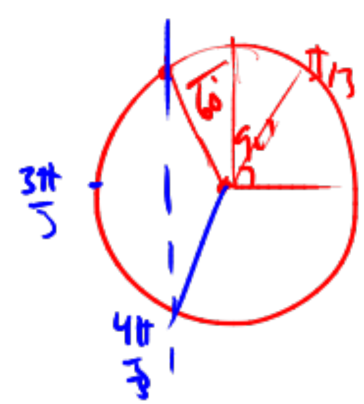
$$-2\cos^2 x - 5\cos x - 2 = 0$$

$w = \cos x \Rightarrow -2w^2 - 5w - 2 = 0$ same as $2w^2 + 5w + 2 = 0$

$$(2w + 1)(w + 2) = 0$$

$$2w = -1$$

$$w = -\frac{1}{2}, \quad w = -2$$



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

$$x = \frac{2\pi}{3} \text{ or } \frac{4\pi}{3}$$

$$\cos x = -\frac{1}{2}$$

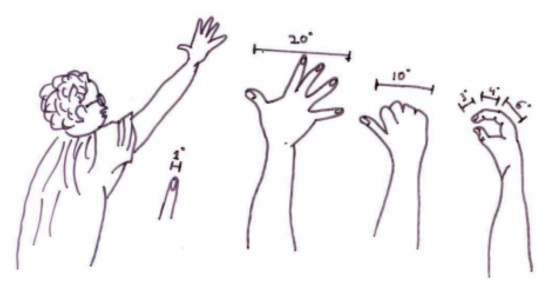
$$\boxed{\cancel{\cos x = -2}}$$

no solns

MA115 :: Section 6.2 & 6.3 :: Right angle trigonometry

There are several methods of measuring angles of varying sophistication (eg., the iGradient app), but I'd like you to learn to use one rather unso-fist-icated method. We will use our own body parts to measure angles.

This is how you do it - stretch out your arm. Your fist will cover an angle of about 10°, your index finger 1° and your open hand about 20°.



First, let's check this using some trig.

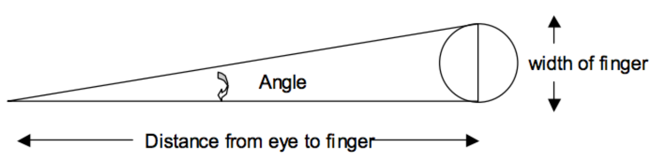
1. Extend your arm in front of you. Measure the distance between your eye and the tip of your finger.

   ____

2. Measure the width of your index finger. (across your finger nail.)

   ____

3. Calculate the angular width of your finger in degrees.



MA115 :: Section 6.2 & 6.3 :: Right angle trigonometry

Example. *Find the height of the old Jamrich Hall, but this time go outside and estimate the angle, height and distance yourself. Compare your answer to the previous one.*

Example. *Mesure the height of a light pole on academic mall.*

Example. *Time permitting,* ***estimate the height of the northeast corner of the new Jamrich Hall****. You'll need a partner to estimate the distance from the fence to the builing using your hands*

$3\sin^2 x - 7\sin x + 2 = 0$ ex. $\sin^{-1}$

$w = \sin x$

$3w^2 - 7w + 2 = 0$

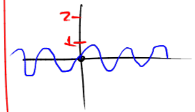
$\underbrace{(3w-1)}_{=0}\underbrace{(w-2)}_{=0} = 0$

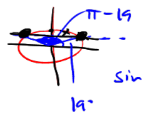
$3w = 1$ $\boxed{\sin x = w = 2}$

$\boxed{\sin x = w = \frac{1}{3}}$

what's x?

$x = \boxed{\sin^{-1}\left(\frac{1}{3}\right)}$, $\sin^{-1}(2)$ Error.





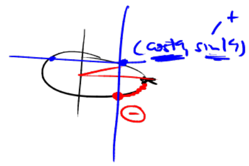
$e^{2x} - e^x - 6 = 0$

↓ quadratic type

$(e^x - 3)(e^x + 2) = 0$

$\sin(\pi - 19) = \sin(19)$

$2\pi - 19°$



(12)

$2(\sin x)^2 - 5\cos x - 4 = 0$

$2(1 - \cos^2 x) - 5\cos x - 4 = 0$

$2 - 2\cos^2 x - 5\cos x - 4 = 0$

$-2\cos^2 x - 5\cos x - 2 = 0$

clear neg signs

$2\cos^2 x + 5\cos x + 2 = 0$

similar to 11, but with the added step that we have BOTH sin(x) and cos(x). before we can proceed as in 11, we need get this down to just one trig function

need relationship b/w sin(x)^2 and cos(x)

$(\sin^2 x + \cos^2 x = 1)$

$\sin^2 x = \boxed{1 - \cos^2 x}$

this factors easily, proceed as in 11

(13)

$\tan^5 x - 9\tan x = 0.$

$\underbrace{\tan x}_{=0}\underbrace{(\tan^4 x - 9)}_{=0} = 0$

$\tan x = 0$

$\frac{\sin x}{\cos x}$ same sols

$\sin x = 0$

$x = n \cdot \pi$, n is any integer

when a fraction/rational expression equals zero, the numerator must equal 0

$\tan^4 x - 9 = \underbrace{(\tan^2 x - 3)}_{=0}\underbrace{(\tan^2 x + 3)}_{=0} = 0$

$\tan^2 x = 3$

$\tan x = \pm\sqrt{3}$

$\tan^2 x = -3$

$\tan x = \sqrt{-3}$

not real

no real sol's.

$\boxed{\tan(120°) = -\sqrt{3}}$

$\boxed{\tan(60°) = \sqrt{3}}$

$60° = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{3\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}, \frac{6\pi}{3}, \ldots = Ak\pi$

$A = \frac{1}{3}$, k is an integer

6.2.3.

$\sin\theta = \frac{3}{5}$, θ is acute

find all trig functions of θ

$\sin^2\theta + \cos^2\theta = 1$

$\left(\frac{3}{5}\right)^2 + \cos^2\theta = 1$

$\cos^2\theta = 1 - \frac{9}{25} = \frac{16}{25} =$

$\boxed{\cos\theta = \frac{4}{5}}$

$\boxed{\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{3/\cancel{5}}{4/\cancel{5}} = 3/4}$

6.2.16

$\cos\theta = -\frac{6}{12}$, $\theta \in$ Quad. III.

both $\sin\theta < 0$

$\cos\theta < 0$

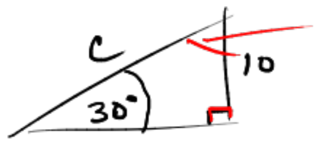
$\tan(\theta)\cot(\theta) = \frac{\tan\theta}{1} \cdot \frac{1}{\tan\theta} = \frac{\tan\theta}{\tan\theta} = 1$

$\csc\theta \cdot \tan\theta = \frac{1}{\cancel{\sin\theta}} \cdot \frac{\cancel{\sin\theta}}{\cos\theta} = \frac{1}{\cos\theta} = \frac{1}{-\frac{6}{12}} = -\frac{12}{6} = -2$

$\sin^2\theta + \cos^2\theta = 1$

6.4 & 6.5 Law of sines and cosines

when you have right triangle



$180 - (30 + 90) = 60°$

find all lengths / angles

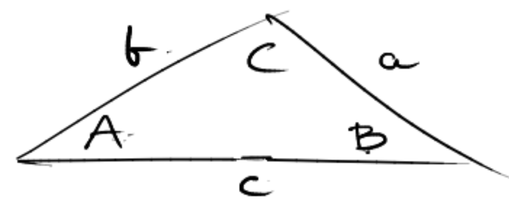
$\sin 30 = \frac{10}{c} \Rightarrow c = \frac{10}{\sin 30} = \frac{10}{1/2}$

$c = 20$

You can "solve" using basic trig definitions

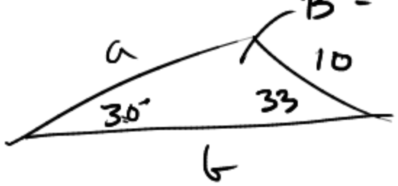
if we don't ...

need Law of Sines:



know $\rightarrow$ $\boxed{\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}}$

$B = 180 - 63 = 127$



$\frac{\sin 30°}{10} = \frac{\sin 33°}{a}$

$a = \sin 33° \left(\frac{10}{\sin 30°} \right)$

$= 10.9$

$\frac{\sin 117}{b} = \frac{\sin 30}{10}$

proceed as here

so, are there any questions?

5.2.13 - webwork $\tan^5 x - 9\tan x = 0.$

$\underbrace{\tan(x)}_{=0}\underbrace{(\tan^4(x) - 9)}_{=0} = 0$

no real sols

$\tan x = \sqrt{-3}$

$\tan^2 x = -3$

$\hookrightarrow (\tan^2 x - 3)\underbrace{(\tan^2 x + 3)} = 0$

Last case:

$\tan^2 x = 3$

$\tan x = \pm\sqrt{3}$

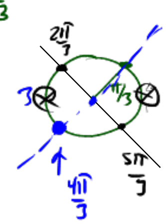
$\tan 60^\circ = \frac{\sqrt{3}/2}{1/2} = \sqrt{3}$

$60^\circ = \frac{\pi}{3}$

$\tan(x) = 0$

$\frac{\sin x}{\cos x}$ means $\sin x = 0$

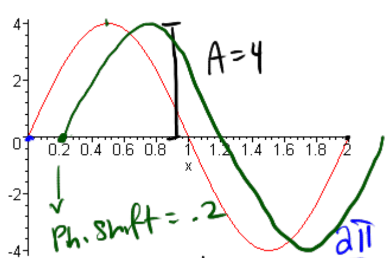
$\Rightarrow x = k\cdot\pi$ where $k \in \mathbb{Z}$



$A\,k\pi$

$\frac{1}{3}k\pi = \frac{k\pi}{3} \longrightarrow$ any multiple of $\frac{\pi}{3}$

5.3.10



Period = 2 = $\frac{2\pi}{k}$

$4\sin(\pi x)$

Amplitude

Amplitude: $\frac{1}{2}$ distance along y-axis from Crest to Trough

sin x: amplitude = 1

Period: length of x-values till graph repeats

Phase Shift: horizontal translation

$A\sin(kx)$

$A\sin(k(x - h))$

phase shift

5.3.2 For

$y = -9\cos(x - \boxed{\frac{\pi}{7}}$

$A = |-9| = 9$

phase shift

1 $\Rightarrow$ period is $\frac{2\pi}{1} = 2\pi$

What about: $y = -5\sin(3x - 9) = -5\sin(3(x-3))$

Amp = 5

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

Phase Shift = 3

5.3.7

$y = \sin(2x + \frac{\pi}{2}) = \sin\left(2\left(x + \frac{\pi}{4}\right)\right) = \sin\left(2x + \frac{2\pi}{4}\right)$

Amp = 1

Ph. Shft = $-\frac{\pi}{4}$

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

Factor 2 out of $\frac{\pi}{2}$ gives $\frac{\pi}{4}$

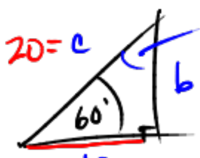
$2x + \frac{2\pi}{2\cdot 9} = 2x + \frac{2\pi}{18}$

$= 2\left(x + \frac{\pi}{18}\right)$

$\rightarrow$ Ph. Shft = $-\pi/18$

6.4 & 6.5 Law of Sines and Cosines

It's easy to solve right Δ's



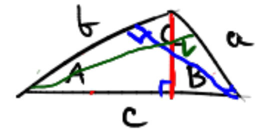
$A = 180 - (60+90) = 30$

$\cos(60°) = \frac{adj}{hyp} = \frac{10}{c}$

$c = \frac{10}{\cos 60°} = \frac{10}{(\frac{1}{2})} = 20$

Pythag Thm ⇒ Find b.

Less Easy



$A = \frac{1}{2} b \cdot h$ (base, ht)

$= \frac{1}{2} c \cdot b \sin A$

$= \frac{1}{2} ba \sin C$

$= \frac{1}{2} ac \sin B$

$$\boxed{\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}}$$

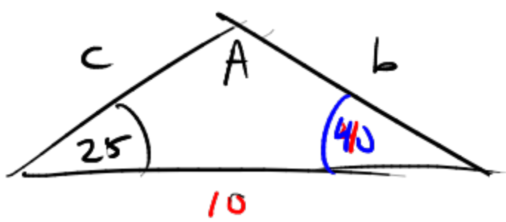
— know this —

$$\frac{2}{abc} \cdot \frac{1}{2} \cancel{bc} \sin A = \frac{2 \cdot \frac{1}{2} \cancel{ab} \sin C}{\cancel{abc}} = \frac{2 \cdot \frac{1}{2} \cancel{ac} \sin B}{\cancel{abc}}$$

$$\frac{\sin A}{a} = \frac{\sin C}{c} = \frac{\sin B}{b}$$

Use law of sines. Solve Δ. Find A, b, c.

$A = 180 - 65 = 115$



ASA

$\frac{\sin 25}{b} = \frac{\sin 115}{10}$

$b = \sin 25 \cdot \frac{10}{\sin 115} = 4.6$

Repeat for c. $\frac{\sin 40}{c} = \frac{\sin 115}{10} \Rightarrow c = \sin 40 \cdot \frac{10}{\sin 115} = 7.1$

Law of Cosines

sort of like pythagorean theorem

$$a^2 = b^2 + c^2 - 2bc\cos A$$