56. Using the Unit Circle Use the unit circle to verify that the cosine and secant functions are even and that the sine, cosecant, tangent, and cotangent functions are odd.

57. Verifying Expressions Are Not Equal Verify that $\cos 2t \neq 2\cos t$ by approximating $\cos 1.5$ and $2\cos 0.75$.

(56) If $\cos(x)$ is even, then so is $\sec(x)$, since $\cos(-x) = \cos(x)$

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

" $\Rightarrow$ " cosine is even.

sine is odd

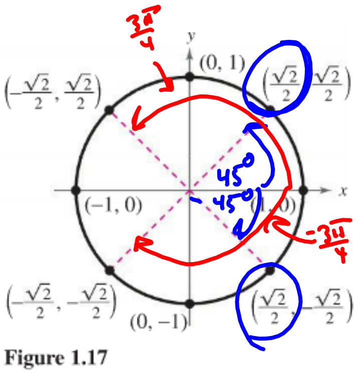


Figure 1.17

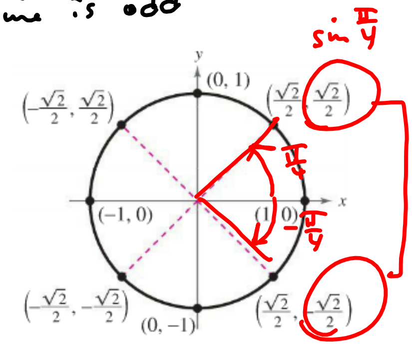


Figure 1.17

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

Arguing for tangent & cotangent.

$\frac{(-1)(2)}{(-2)(-3)} = -\frac{1}{3}$

$\frac{(-)(+)}{(-)(-)} = -$

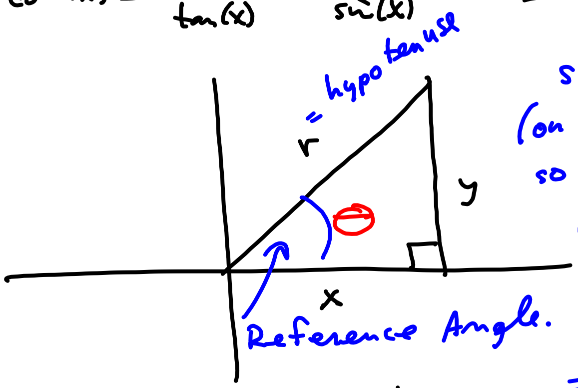
$\csc(x) = \frac{1}{\sin x}$ is also odd.

ODD : $f(-x) = -f(x)$ " $-$ "

EVEN : $f(-x) = f(x)$ " $+$ "

$\tan(x) = \frac{\sin(x)}{\cos(x)} = \frac{-}{+} = -$ ODD

$\cot(x) = \frac{1}{\tan(x)} = \frac{\cos(x)}{\sin(x)} = \frac{+}{-} = -$ ODD



$\sin(\theta) = \frac{y}{r} = \frac{\text{opp}}{\text{hypot.}}$

(on unit circle, $r = 1$, so $\sin\theta_1 = \frac{y}{1} = y$)

$\cos(\theta) = \frac{x}{r} = \frac{\text{adj.}}{\text{hypot}}$

$\tan(\theta) = \frac{y}{x} = \frac{\text{opp}}{\text{adj.}} =$

= Slope of the ray!

adj = adjacent = a

opp = opposite = o

c = cosine

s = sine

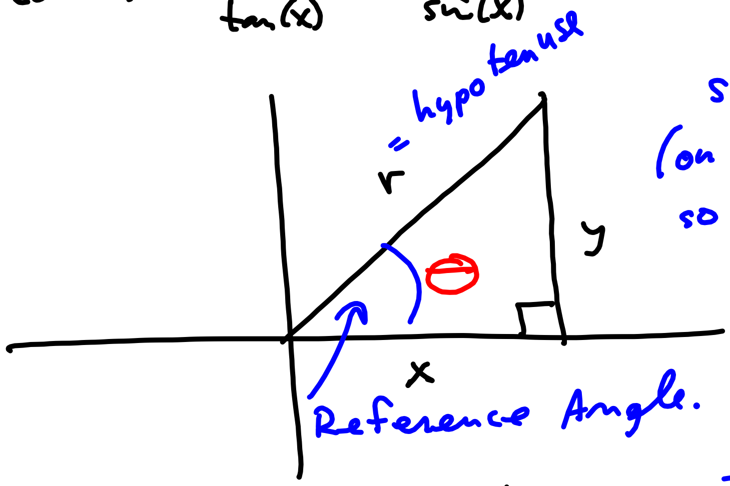
t = tangent

sohcahtoa

$\tan(\ ) = \frac{y}{x} = \frac{\frac{y}{h}}{\frac{x}{h}} = \frac{\sin\theta}{\cos\theta}$

$$\tan(x) = \frac{\sin(x)}{\cos(x)} = \frac{-}{+} = - \quad \text{ODD}$$

$$\cot(x) = \frac{1}{\tan(x)} = \frac{\cos(x)}{\sin(x)} = \frac{+}{-} = - \quad \text{ODD}$$



$\sin(\theta) = \frac{y}{r} = \frac{\text{opp}}{\text{hypot.}}$

(on unit circle, $r = 1$, so $\sin(\theta) = \frac{y}{1} = y$)

$\cos(\theta) = \frac{x}{r} = \frac{\text{adj.}}{\text{hypot}}$

$\tan(\theta) = \frac{y}{x} = \frac{\text{opp}}{\text{adj.}} =$

= slope of the ray!

adj = adjacent = a

opp = opposite = o

c = cosine

s = sine

t = tangent

sohcahtoa

$$\tan(\;) = \frac{y}{x} = \frac{\frac{y}{h}}{\frac{x}{h}} = \frac{\sin\theta}{\cos\theta}$$

57. Verifying Expressions Are Not Equal Verify that $\cos 2t \neq 2\cos t$ by approximating $\cos 1.5$ and $2\cos 0.75$.

$$\cos(2(1.5)) = \cos\left(2\left(\frac{1.5\text{ rad}}{1}\cdot\frac{180^\circ}{\pi\text{ rad}}\right)\right) \approx -.990$$

degrees mode:

Radians mode:

```
cos(2*1.5*180/π)
       -.9899924966
cos(2*1.5
       -.9899924966
2cos(1.5)
        .1414744033
```

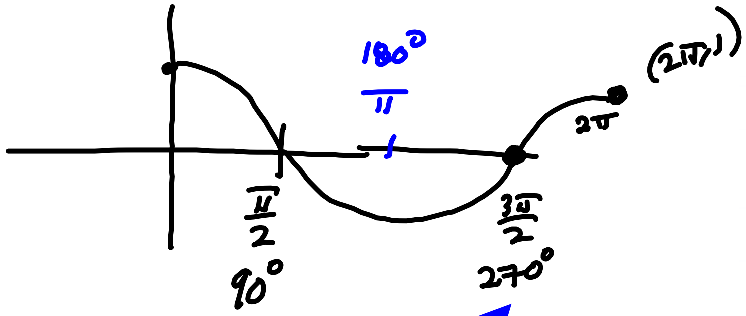
$$2\cos(1.5) \approx .14147$$

See? They're different!

$\cos(t) = \frac{4}{5}$, Find $\cos(\pi - t)$ & $\cos(\pi + t)$

cofunction identities. Trying to make you appreciate §1.3, more.

$\cos(t)$



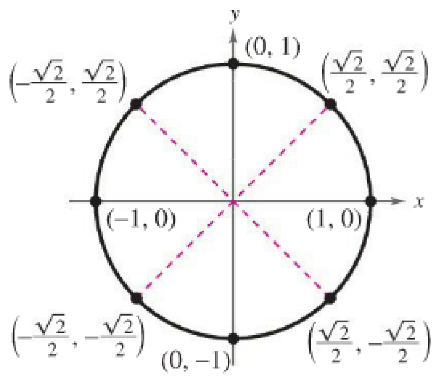
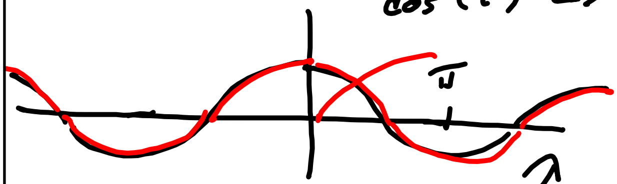


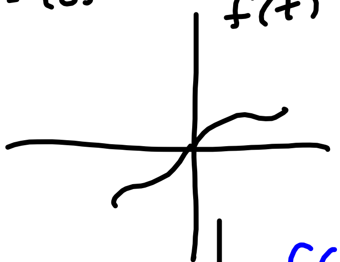
Figure 1.17

$\cos(\pi - t)$

$= \cos(-(t - \pi))$

$\cos(t) \Rightarrow \cos(-t) = \cos t$





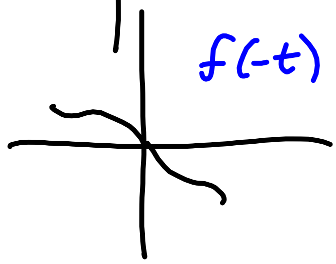
$f(t)$

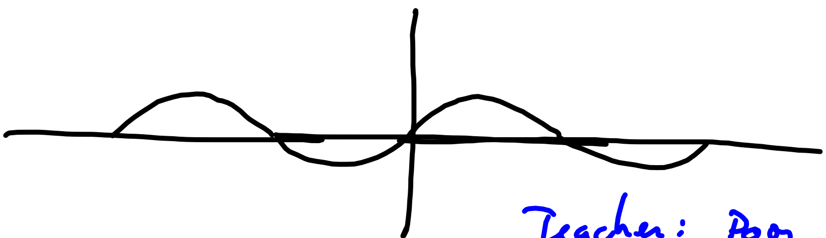
$\cos(t - \pi)$

$\cos(\pi - t)$

$= \sin(t)$!

$f(-t)$





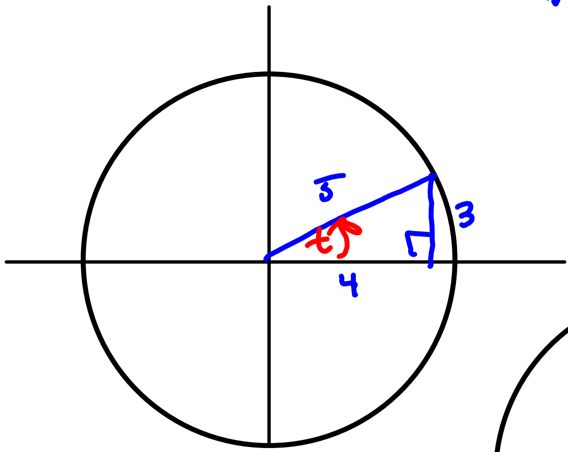
$\cos(t + \pi) = -\sin(t)$

Teacher: Poor job of scaffolding! Didn't do enough groundwork to really assign this one.

#42 – A better argument

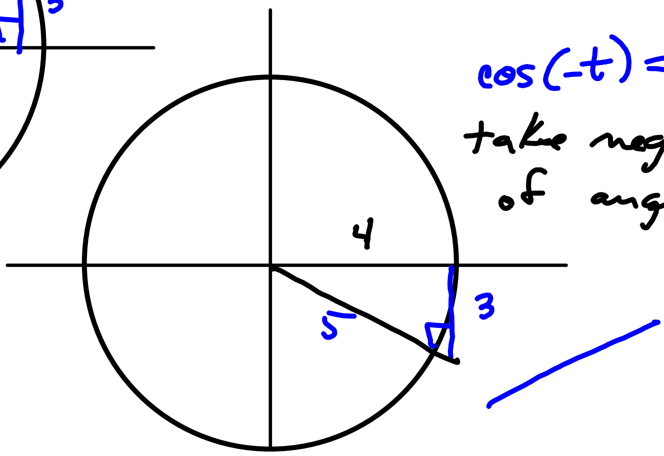
$\cos t = \frac{4}{5}$

$0 < t < 90^\circ = \frac{\pi}{2}$



$\cos(-t) = \frac{4}{5}$

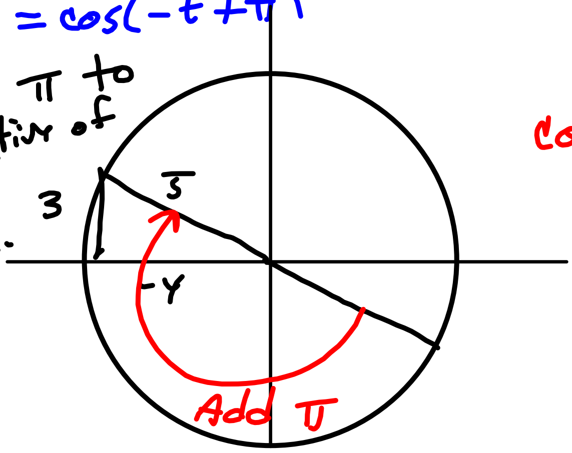
take negative of angle



$\cos(\pi - t)$

$= \cos(-t + \pi)$

Add π to negative of the angle.



$\cos(-t + \pi) = -\frac{4}{5}$

$\cos(t + \pi$

Sorry my scaffolding was poor for this discussion. It's because I know how the movie ends, & I'm dumb.

$\cos(\pi + t) = -\frac{4}{5}$

Add $\pi = 180^\circ$ to original angle