Today: 1.3 and 1.4 stuff.

Evaluating Trigonometric Functions **In Exercises 13–20, sketch a right triangle corresponding to the trigonometric function of the acute angle θ. Use the Pythagorean Theorem to determine the third side and then find the other five trigonometric functions of θ.**

13. $\tan\theta = \frac{3}{4}$ **14.** $\cos\theta = \frac{5}{6}$

15. $\sec\theta = \frac{3}{2}$ **16.** $\tan\theta = \frac{4}{5}$

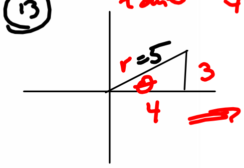
17. $\sin\theta = \frac{1}{5}$ **18.** $\sec\theta = \frac{17}{7}$

19. $\cot\theta = 3$ **20.** $\csc\theta = 9$

§1.3

13

$\tan\theta = \frac{3}{4}$



$r^2 = 3^2 + 4^2 = 9+16 = 25$

$\Rightarrow r^2 = 25$

$r = 5$

$\sin\theta = \frac{3}{5}$ $\csc\theta = \frac{5}{3}$

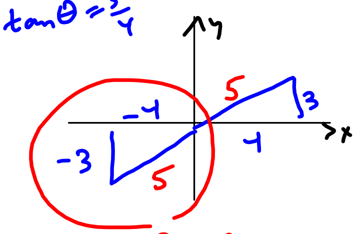
$\cos\theta = \frac{4}{5}$ $\sec\theta = \frac{5}{4}$

$\tan\theta = \frac{3}{4}$ $\cot\theta = \frac{4}{3}$

#13 in §1.4 context.

Given $\tan\theta = \frac{3}{4}$ and $\sin\theta < 0$, find the 6 trigs.

$\tan\theta = \frac{3}{4}$



AND $\sin\theta < 0$

$\sin\theta = -\frac{3}{5}$ $\csc\theta = -\frac{5}{3}$

$\cos\theta = -\frac{4}{5}$ $\sec\theta = -\frac{5}{4}$

$\tan\theta = \frac{3}{4}$ $\cot\theta = \frac{4}{3}$

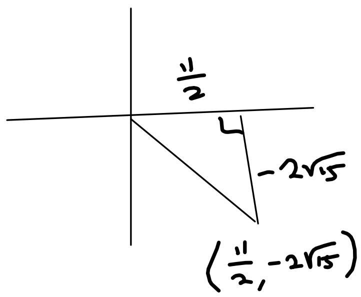
7. 0/6 points LarTrig10 1.4.018. [3881707]

The point is on the terminal side of an angle in standard position. Find the exact values of the six trigonometric functions of the angle.

$\left(5\frac{1}{2}, -2\sqrt{15}\right)$ ugh!

S1.4 # 7

$\sin\theta =$	✗	$-\frac{4\sqrt{15}}{19}$
$\cos\theta =$	✗	$\frac{11}{19}$
$\tan\theta =$	✗	$-\frac{4\sqrt{15}}{11}$
$\csc\theta =$	✗	$-\frac{19}{4\sqrt{15}}$
$\sec\theta =$	✗	$\frac{19}{11}$
$\cot\theta =$	✗	$-\frac{11}{4\sqrt{15}}$



$$r^2 = \left(\frac{11}{2}\right)^2 + \left(-2\sqrt{15}\right)^2$$

$$= \frac{121}{4} + 4\cdot 15 = \frac{121}{4} + \frac{60}{1}\cdot\frac{4}{4} = \frac{121+240}{4}$$

$$= \frac{361}{4} \Rightarrow$$

$$r = \pm\sqrt{\frac{361}{4}}$$

$$= \pm\frac{19}{2}$$

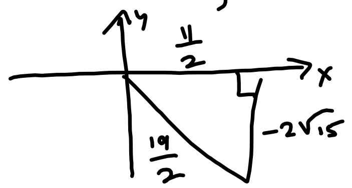
$$\& \; r>0 \Rightarrow \boxed{r = \frac{19}{2}}$$

```
361^.5
         19.00000000
√(361)
         19.00000000
361^(1/2)
         19.00000000
361^1/2
```

```
         19.00000000
√(361)
         19.00000000
361^(1/2)
         19.00000000
361^1/2
         180.5000000
```

Bad! Hierarchy of Operations

So, re-drawing it:



$$\sin\theta = \frac{-2\sqrt{15}}{\frac{19}{2}} = \left(-2\sqrt{15}\right)\left(\frac{2}{19}\right) \boxed{= \frac{-4\sqrt{15}}{19} = \sin\theta}$$

$$\csc\theta = \frac{-19}{4\sqrt{15}} = \boxed{\frac{-19\sqrt{15}}{60} = \csc\theta}$$

$(4)(15)$

etc.

§1.4 # 33

33. 0/4 points LarTrig10 1.4.092. [3881642]

Find two solutions of the equation. Give your answers in degrees ($0° \le \theta < 360°$) and in radians ($0 \le \theta < 2\pi$). Do not use a calculator. (Do not enter your answers with degree symbols. Enter your answers as comma-separated lists.)

(a) $\cos\theta = \frac{\sqrt{2}}{2}$

degrees [ ] ✗ $45, 315$

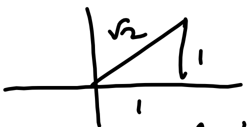
radians [ ] ✗ $\frac{\pi}{4}, \frac{7\pi}{4}$

(b) $\cos\theta = -\frac{\sqrt{2}}{2}$

degrees [ ] ✗ $135, 225$

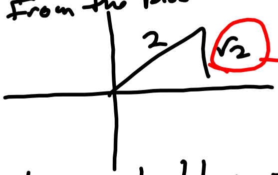
radians [ ] ✗ $\frac{3\pi}{4}, \frac{5\pi}{4}$

$\cos\theta = \frac{\sqrt{2}}{2}$

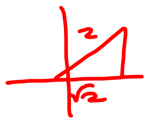


$\cos\theta = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ FROM Technique

From the problem:



$\cos\theta = \frac{\sqrt{2}}{2}$ → NO. $\cos\theta = \frac{\sqrt{2}}{2}$ is



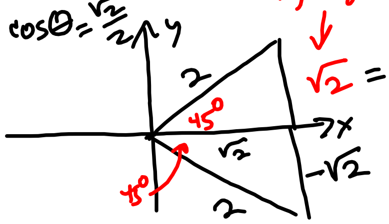
When in doubt on these, you can cheat it with a calculator in Degrees MODE

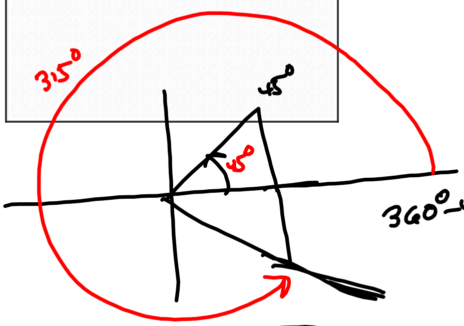
```
cos⁻¹(√(2)/2)
     45.00000000
```

$\cos\theta = \frac{\sqrt{2}}{2}$

Pythagorus

$\sqrt{2} = y$





$360° - 45° = 315°$

$2^2 = \sqrt{2}^2 + y^2$

$\Rightarrow y^2 = 4 - 2 = 2$

$\Rightarrow y = \pm\sqrt{2}$

$$\boxed{\theta = 45°, 315° \text{ OR } \theta = \frac{\pi}{4}, \frac{7\pi}{4}}$$

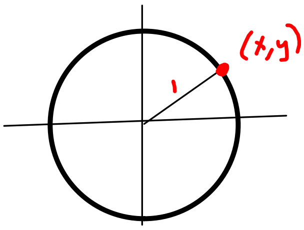
$(315°)\left(\frac{\pi}{180°}\right) = \frac{7\pi}{4}$

$\frac{\cancel{315}^{\cancel{63}\,7}}{\cancel{180}_{\cancel{36}\,4}}$

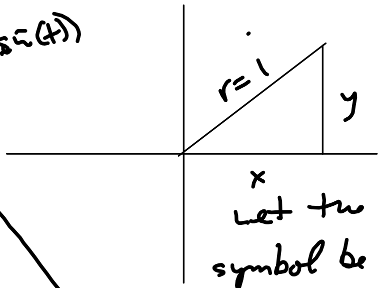
3

§1.2 Unit Circle

Consider a circle of radius $r=1$



$(x,y) = (\cos(t), \sin(t))$



Let the variable/angle symbol be t.

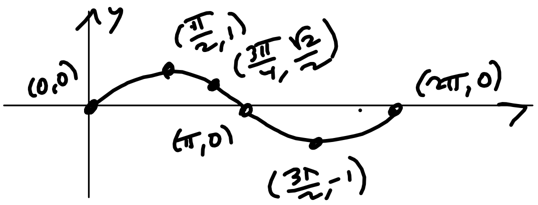
$$\begin{cases} \sin t = \frac{y}{r} = \frac{y}{1} = y \\ \cos t = \frac{x}{r} = \frac{x}{1} = x \end{cases}$$

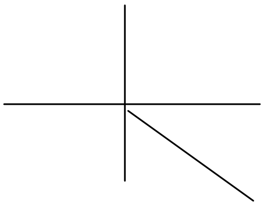
Recall, arc length

$s = r\theta = rt = t$, so

on the unit circle, ANGLE = ARC LENGTH.

Graph of $\sin(t)$ or $\sin\theta$





t	$\sin(t)$
0	0
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{2}$	1
$\frac{3\pi}{4}$	$\frac{\sqrt{2}}{2}$
π	0
$\frac{5\pi}{4}$	$-\frac{\sqrt{2}}{2}$
$\frac{3\pi}{2}$	-1
$\frac{7\pi}{4}$	$-\frac{\sqrt{2}}{2}$
2π	0

One period of sine.

This is the graph of $(t, \sin(t))$

IT'S A WAVE!

Now, when we graph $(\cos(t), \sin(t))$, we get a circle!

Evaluating Sine, Cosine, and Tangent In Exercises 13–22, evaluate (if possible) the sine, cosine, and tangent at the real number.

13. $t = \frac{\pi}{4}$ 14. $t = \frac{\pi}{3}$

15. $t = -\frac{\pi}{6}$ 16. $t = -\frac{\pi}{4}$

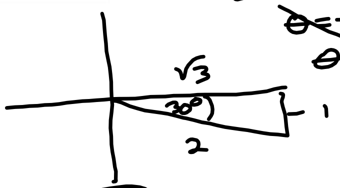
Writeup

#s 13–22, we evaluate sine, cosine and tangent at the given real #.

#15 $t = -\frac{\pi}{6} = -\frac{\pi}{6} \cdot \frac{180^\circ}{\pi} = -30^\circ$

$\cancel{\theta = -30^\circ}$

$\cancel{\theta' = 30^\circ}$



$t = -\frac{\pi}{6}$

$t' = \frac{\pi}{6}$

OR $t = -30^\circ \rightarrow$

$t' = 30^\circ$

$\boxed{\sin(t) = -\frac{1}{2} \quad \cos(t) = \frac{\sqrt{3}}{2}}$

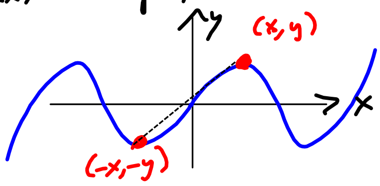
$\tan(t) = -\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{-\frac{\sqrt{3}}{3} = \tan(t)}$

etc.

Recall: ODD function $f(x)$ means

$f(-x) = -f(x)$ Symmetric thru the origin

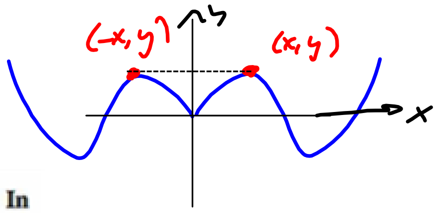
$\sin(x), \tan(x),$
$\csc(x), \cot(x)$



EVEN Function $f(x)$ means Symmetric thru y-axis

$f(-x) = f(x)$

$\cos(x), \sec(x)$



Using the Value of a Trigonometric Function In Exercises 37–42, use the value of the trigonometric function to evaluate the indicated functions.

37. $\sin t = \frac{1}{2}$
(a) $\sin(-t)$
(b) $\csc(-t)$

38. $\sin(-t) = \frac{3}{8}$
(a) $\sin t$
(b) $\csc t$

39. $\cos(-t) = -\frac{1}{5}$
(a) $\cos t$
(b) $\sec(-t)$

40. $\cos t = -\frac{3}{4}$
(a) $\cos(-t)$
(b) $\sec(-t)$

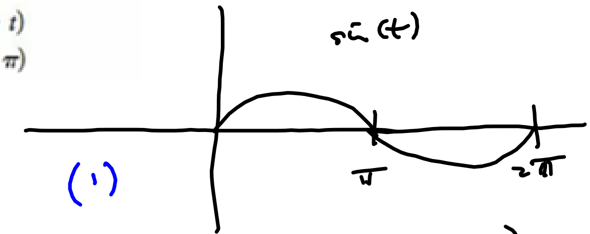
41. $\sin t = \frac{4}{5}$
(a) $\sin(\pi - t)$
(b) $\sin(t + \pi)$

42. $\cos t = \frac{4}{5}$
(a) $\cos(\pi - t)$
(b) $\cos(t + \pi)$

#37 $\sin(t) = \frac{1}{2}$

(a) $\sin(-t) = -\sin(t) = -(\frac{1}{2}) \boxed{= -\frac{1}{2} = \sin(-t)}$

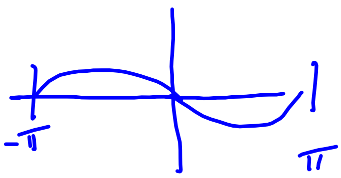
(b) $\csc(-t) = -\csc(t) \boxed{= -\frac{1}{2} = \csc(-t)}$



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

(1) $\sin(t)$
(2) $\sin(t + \pi)$ Left π
(3) $\sin(-t + \pi)$ Flip horizontally

(2)



$\sin(\pi - t) = \sin(t)$!

(3)