

Algebra III
Section 7.5 Notes

Other Trig Functions

tangent (tan) secant (sec)
cotangent (cot) cosecant (csc)

$$\sin \theta = \frac{y}{r} \qquad \cos \theta = \frac{x}{r} \qquad \tan \theta = \frac{y}{x}$$

$$\csc \theta = \frac{r}{y} \qquad \sec \theta = \frac{r}{x} \qquad \cot \theta = \frac{x}{y}$$

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RECIPROCAL

sec θ and cos θ are reciprocals csc θ and sin θ are reciprocals

$$\sec \theta = \frac{1}{\cos \theta} \qquad \csc \theta = \frac{1}{\sin \theta}$$

Since sin $\theta = y$ and cos $\theta = x$

$$\tan \theta = \frac{y}{x} = \frac{\sin \theta}{\cos \theta} \qquad \cot \theta = \frac{x}{y} = \frac{\cos \theta}{\sin \theta}$$

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POSITIVE TRIG VALUES

sin	↑	All
csc		
tan	→	cos
cot		

Example 1

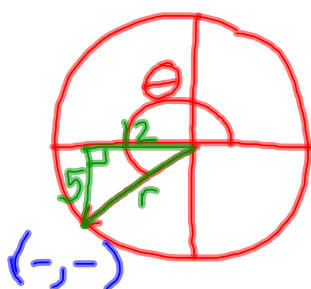
Use a calculator to find the following.

a) $\sin 27^\circ$ b) $\tan 175^\circ$ c) $\sec 42^\circ$ d) $\cot 7$ e) $\csc(-1)$

$.4540$ $-.0875$ \downarrow $\frac{1}{\tan 7} = \frac{\cos 7}{\sin 7}$ $\frac{1}{\sin(-1)}$

$\frac{1}{\cos 42^\circ} = 1.3456$ $= -1.1884$

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Example 2If θ is in the 3rd quadrant and $\tan\theta = \frac{5}{12}$ find the other five trig functions.

$$\tan \theta = \frac{5}{12} = \frac{y}{x}$$

$$x^2 + y^2 = r^2 \quad \sin \theta = \frac{-5}{13}$$

$$12^2 + 5^2 = r^2 \quad \csc \theta = \frac{-13}{5}$$

$$144 + 25 = r^2 \quad \cos \theta = \frac{-12}{13}$$

$$169 = r^2$$

$$r = 13 \quad \sec \theta = \frac{-13}{12}$$

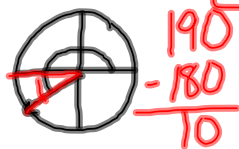
$$\cot \theta = \frac{12}{5}$$

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Example 3

Express each of the following in term of a reference angle.

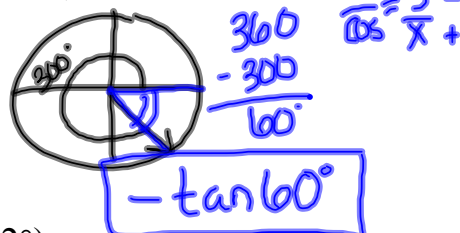
a) $\sin 190^\circ = -\sin 10^\circ$



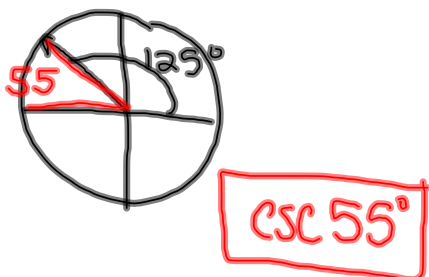
b) $\sec(-100^\circ)$



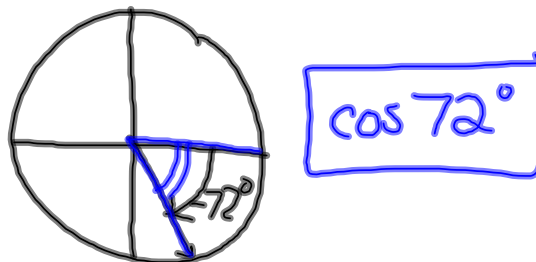
c) $\tan 300^\circ$



d) $\csc 125^\circ$



e) $\cos(-72^\circ)$



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Homework**p285****#1ab, 2ab,****3abc, 5abc,****7, 13, 15, 17**

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Example 4Give the value of x (in radians) for which $\sec(x)$ is:

a) 1

$$\sec x = 1$$

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

$$\cos x = 1$$



$$x = 2\pi n$$

b) 0

$$\sec x = 0$$

~~$$\frac{1}{\cos x} = 0 \cdot \cos x$$~~

$$1 \neq 0$$

No solution

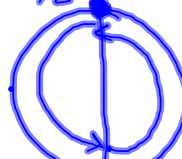
c) undefined

$$\sec x = \text{undefined}$$

$$\frac{1}{\cos x} = \text{undefined}$$

can't \div by zero

$$\frac{1}{2} \cos x = 0$$



$$x = \frac{\pi}{2} \pm \pi n$$

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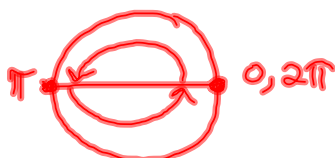
Example 5Give the value of x (in radians) for which $\tan(x)$ is:

a) 0

$$\tan x = 0$$

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

$$\sin x = 0$$



$$x = 0 \pm \pi n$$

$$x = \pi n$$

b) 1

$$\tan x = 1$$

~~$$\frac{\sin x}{\cos x} = 1$$~~

$$\sin x = \cos x$$



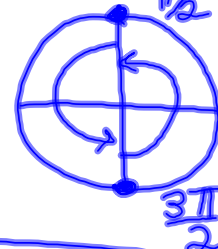
$$x = \frac{\pi}{4} \pm \pi n$$

c) undefined

$$\tan x = \text{undefined}$$

~~$$\frac{\sin x}{\cos x} = \text{undefined}$$~~

$$\cos x = 0$$

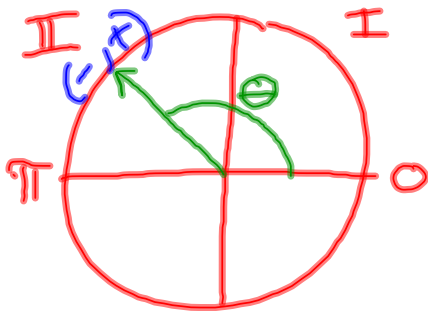


$$x = \frac{\pi}{2} \pm \pi n$$

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Example 6

$\tan \theta = -\frac{3}{4}$ and $0 < \theta < \pi$. Find the other trig values.



$$\tan \theta = -\frac{3}{4} = \frac{y}{x} = \frac{3}{-4}$$

$$x^2 + y^2 = r^2$$

$$(-4)^2 + (3)^2 = r^2$$

$$16 + 9 = r^2$$

$$\pm \sqrt{25} = r$$

$$\cos \theta = \frac{x}{r} = \frac{-4}{5} \quad r = 5$$

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

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

$$\sin \theta = \frac{y}{r} = \frac{3}{5}$$

$$\csc \theta = \frac{r}{y} = \frac{5}{3}$$

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Example 7

Find the exact values.

a) $\sec 150^\circ$

$$\frac{1}{\cos 150^\circ} = \frac{1}{-\frac{\sqrt{3}}{2}} = \frac{2\sqrt{3}}{\sqrt{3}\sqrt{3}} = -\frac{2\sqrt{3}}{3}$$

b) $\tan(-225^\circ) = \frac{\sin x}{\cos x} = \frac{\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = -1$

c) $\sec 180^\circ$

$$\frac{1}{\cos 180^\circ} = \frac{1}{-1} = -1$$

$(-1, 0)$

d) $\tan 90^\circ = \frac{\sin x}{\cos x} = \frac{1}{0}$

undefined

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