

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**THE SIX TRIGONOMETRIC FUNCTIONS**  
**ALGEBRA 2 HONORS**

At this point you have extensively studied the sine and cosine functions, which are undoubtedly the most important of all periodic functions. But, there are four more trigonometric functions, which are all defined in terms of sine and cosine.

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

Of these, the **tangent** functions should be familiar to you, while the cotangent, secant and cosecant functions are new.

**Exercise #1:** Given what you know about the sine and cosine functions, state the **exact** value of each of the following in simplest radical form.

(a)  $\tan(45^\circ)$

(b)  $\sec(30^\circ)$

(c)  $\cot(120^\circ)$

(d)  $\csc\left(\frac{3\pi}{4}\right)$

(e)  $\tan\left(\frac{\pi}{3}\right)$

(f)  $\sec\left(\frac{5\pi}{3}\right)$

**Calculator note:** Your graphing calculator **does not** have secant, cosecant, or cotangent buttons on it. Therefore, if you wanted to use your calculator to evaluate (f) above you would need to enter:

$1/\cos(5\pi/3)$	2
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**Exercise #2:** At which of the following values of  $x$  is the function  $f(x) = \tan x$  undefined?

- (1)  $0^\circ$                       (2)  $180^\circ$                       (3)  $90^\circ$                       (4)  $270^\circ$

**Exercise #3:** At which of the following values of  $\theta$  is  $\csc \theta$  undefined?

- (1)  $\frac{\pi}{4}$                       (2)  $\pi$                       (3)  $\frac{\pi}{2}$                       (4)  $\frac{3\pi}{2}$

**Exercise #4:** In each of the following, state whether the given trigonometric function is positive (+) or negative (-) for the given quadrant.

- (a)  $\tan \theta$  for II                      (b)  $\csc \theta$  for IV                      (c)  $\sec \theta$  for III

**Exercise #5:** For a given angle  $\alpha$  it is known that  $\csc \alpha > 0$  and  $\cos \alpha < 0$ . Therefore, the angle,  $\alpha$ , must terminate in which quadrant?

- (1) I                      (2) II                      (3) III                      (4) IV

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**THE SIX TRIGONOMETRIC FUNCTIONS**  
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1. State the *exact* value for each of the following:

(a)  $\tan(150^\circ)$

(b)  $\csc(270^\circ)$

(c)  $\sec(45^\circ)$

(d)  $\cot\left(\frac{\pi}{2}\right)$

(e)  $\sec\left(\frac{2\pi}{3}\right)$

(f)  $\csc\left(\frac{4\pi}{3}\right)$

(g)  $\tan\left(\frac{9\pi}{4}\right)$

(h)  $\sec\left(-\frac{\pi}{3}\right)$

(i)  $\csc\left(\frac{7\pi}{2}\right)$

2. If  $f(x) = x + \tan x$ , where  $x$  is in units of radians, then  $f\left(\frac{\pi}{4}\right) =$ 

(1)  $\frac{1+\pi}{4}$

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

(3)  $\frac{4+\pi}{4}$

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

3. For which of the following values of  $\alpha$  is  $\cot \alpha$  undefined?

(1)  $45^\circ$

(2)  $90^\circ$

(3)  $270^\circ$

(4)  $180^\circ$

4. For which of the following values of  $\theta$  is  $\sec(2\theta)$  undefined?

(1)  $45^\circ$

(2)  $90^\circ$

(3)  $180^\circ$

(4)  $0^\circ$

5. In the given table, label each function as being positive (+) or negative (-) in the stated quadrant.

	I	II	III	IV
$\sin \theta$				
$\cos \theta$				
$\tan \theta$				
$\sec \theta$				
$\csc \theta$				
$\cot \theta$				

6. It is known that for a given angle  $\theta$  that  $\sin \theta > 0$  and  $\sec \theta < 0$ . In which quadrant does the angle terminate?

- (1) I                      (2) II                      (3) III                      (4) IV

7. It is known that for a given angle  $\theta$  that  $\tan \theta < 0$  and  $\cos \theta > 0$ . In which quadrant does the angle terminate?

- (1) I                      (2) II                      (3) III                      (4) IV

8. It is known that for a given angle  $\theta$  that  $\csc \theta < 0$  and  $\sec \theta < 0$ . In which quadrant does the angle terminate?

- (1) I                      (2) II                      (3) III                      (4) IV

9. It is known that for a given angle  $\theta$  that  $\cos \theta > 0$  and  $\tan \theta > 0$ . In which quadrant does the angle terminate?

- (1) I                      (2) II                      (3) III                      (4) IV