Name:_____ Date:_____

PC: Reciprocal Trig Functions Ms. Loughran

Each of the basic trigonometric functions has a corresponding reciprocal function. The **secant** function (sec) is the reciprocal of the cosine function, the **cosecant** function (csc) is the reciprocal of the sine function, and the **cotangent** function (cot) is the reciprocal of the tangent function.

$\sec\theta = \frac{1}{\cos\theta}, \cos\theta \neq 0$ $\csc\theta = \frac{1}{\sin\theta}, \sin\theta \neq 0$ $\cot\theta = \frac{1}{\tan\theta}, \tan\theta \neq 0$

Also since $\tan\theta = \frac{\sin\theta}{\cos\theta}$, then $\cot\theta =$.

1. Name the quadrant in which $\angle A$ must lie if $\sec A > 0$ and $\csc A < 0$.

2. Find the exact value of: (a) $\sec 120°$
   (b) $\cot 210°$

Exercises

1 Copy and complete the table.

θ	0°	30°	45°	60°	90°	180°	270°	360°
sec θ								
csc θ								
cot θ								

2 In the interval $0 \leq \theta \leq 360°$, identify all values at which the function is undefined:

a sec θ
b csc θ
c cot θ

3 Determine the quadrant in which x lies if

a $\sin x > 0$ and $\cot x < 0$
b $\csc x < 0$ and $\cot x < 0$
c $\sec x > 0$ and $\sin x < 0$
d $\cot x < 0$ and $\sec x < 0$
e $\cos x > 0$ and $\csc x > 0$

Exercises 4–10: Find the exact value of each expression.

4 sec 300°

5 csc 225°

6 cot 270°

7 cot 420°

8 csc (−210°)

9 (sec 150°)(cos 150°)

10 (tan 300°)(cot 300°)

Exercises 11–15: Use a calculator and approximate each value to the *nearest thousandth.*

11 csc 238°

12 sec 410°

13 cot (−35°)

14 cot 125°

15 csc 325°

Exercises 16–20: Select the numeral preceding the choice that best completes the statement or answers the question.

16 (sec θ)(cos θ) =

(1) 1
(2) 0
(3) undefined
(4) varies depending upon the value of θ

17 Which expression is equivalent to csc 45°?

(1) $\frac{1}{\sin 45°}$
(2) $\frac{1}{\sec 45°}$
(3) $\frac{1}{\tan 45°}$
(4) sin (−45°)

18 If $f(x) = 2 \sec x$, find $f(30°)$.

(1) $\frac{2\sqrt{3}}{3}$
(2) 2
(3) $\sqrt{3}$
(4) $\frac{4\sqrt{3}}{3}$

19 If $g(x) = \sin x + \csc x$, find $g(90°)$.

(1) 1
(2) 2
(3) 0
(4) −2

20 Which expression is equal in value to sec 180°?

(1) csc 180°
(2) tan 180°
(3) cot 135°
(4) cos 225°

21 The expression $\cos 290°$ is equivalent to

(1) $\cos 70°$
(2) $\cos 20°$
(3) $-\cos 20°$
(4) $-\cos 70°$

22 What single transformation moves a fourth-quadrant angle to its equivalent first-quadrant reference angle?

(1) reflection in the y-axis
(2) reflection in the origin
(3) reflection in the x-axis
(4) reflection in the line $y = x$

23 Which expression has the greatest value?

(1) $\sin 120°$
(2) $\sin 150°$
(3) $\tan 240°$
(4) $\cos 315°$

24 Which expression is *not* equal to $\sin 210°$?

(1) $-\sin 30°$
(2) $\sin(\pm 30°)$
(3) $\sin 30°$
(4) $-\cos 60°$

25 Evaluate:
$(\cos 315°)^2(\sin 30°) + (\tan 135°)(\cos 180°)$

(1) $-\frac{3}{4}$
(2) $\frac{1}{2}$
(3) $\frac{3}{4}$
(4) $\frac{5}{4}$

26 Find the exact value of $(\tan 120°)^2 - \cos 180°$.

(1) $\sqrt{3} + 1$
(2) 2
(3) 3
(4) 4

27 The value of $\tan 315°$ is the same as the value of

(1) $\cos 0°$
(2) $\sin 90°$
(3) $\tan 135°$
(4) $\sin 180°$

28 What is the reference angle for $-132°$?

(1) 42°
(2) 48°
(3) 138°
(4) 228°

29 If the coordinates of point A are $(1, 0)$ and the coordinates of B are $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$, what is the measure of $\angle AOB$?

(1) 120°
(2) 135°
(3) 150°
(4) 330°

30 The expression $\sin(360° - x)$ is equivalent to

(1) $\sin x$
(2) $-\sin x$
(3) $\cos x$
(4) $-\cos x$

31 The expression $\tan 180°$ has the same value as

(1) $\tan 90°$
(2) $\cos 180°$
(3) $\sin 270°$
(4) $\sin 180°$

32 Which is a *false* statement?

(1) Tan θ is undefined whenever $\cos\theta$ equals zero.
(2) If $\sin\theta = \frac{\sqrt{3}}{2}$, $|\cos\theta| = \frac{1}{2}$.
(3) If $\cos\theta = 0$, then $|\sin\theta| = 1$.
(4) Sin θ = cos θ only in Quadrant I.