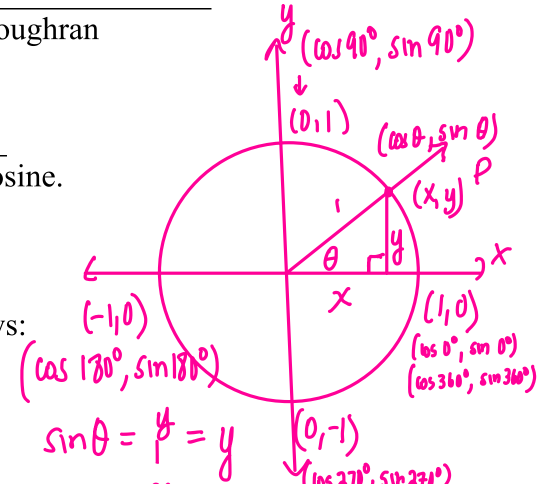
Name: ________________________________ Date:_______________

PC: Review of Trig from Algebra 2 Ms. Loughran

SOH CAH TOA

The unit circle is a circle with center at the origin and radius 1.
Therefore its equation is: $x^2 + y^2 = 1$
The first two trigonometric functions we will study are sine and cosine.



In the figure at the right, angle θ is in standard position. Point P represents the intersection of the unit circle and the terminal side of angle θ in standard position. We define the functions as follows:

The sine of θ is the y-coordinate of P.
The cosine of θ is the x-coordinate of P.
Also we can express tangent in terms of sine and cosine.

$\sin\theta = \frac{y}{1} = y$

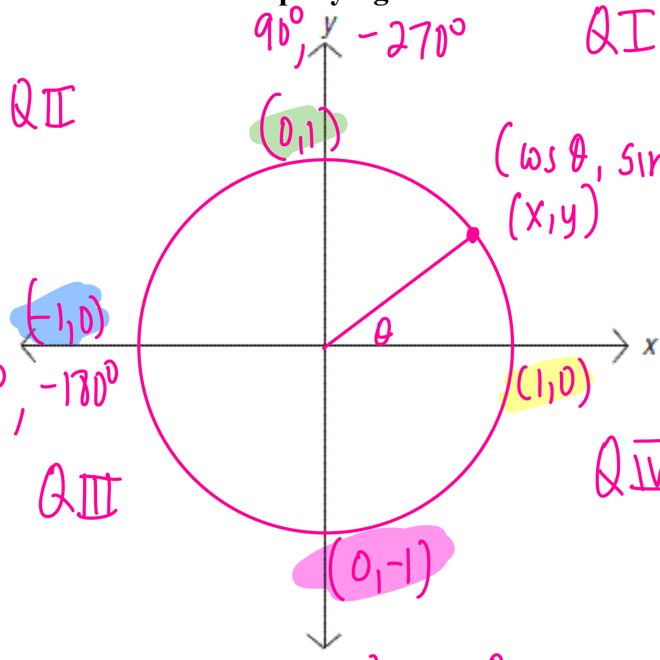
$\cos\theta = \frac{x}{1} = x$

$\sin 90° = 1$

$\cos 90° = 0$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{y}{x}, x \neq 0$$

Notice the signs of these functions depend on the quadrant in which angle θ lies.
Draw the unit circle on the axes provided. Label the four points where the circle intersects the axes. Use those points and what we have just learned about sine, cosine and tangent to fill in the accompanying table.



SINE
QII
cos θ ⊖
sin θ ⊕
tan θ ⊖

QI
cos θ ⊕
sin θ ⊕
tan θ ⊕
ALL

TANGENT
QIII
cos θ ⊖
sin θ ⊖
tan θ ⊕

QIV
cos θ ⊕
sin θ ⊖
tan θ ⊖
COSINE

θ in degrees	0°	90°	180°	270°	360°
θ in radians	0	$\pi/2$	π	$3\pi/2$	2π
$\sin\theta$	0	1	0	-1	0
$\cos\theta$	1	0	-1	0	1
$\tan\theta$	0	undefined	0	undefined	0

$\cancel{90°}^{1} \cdot \frac{\pi}{\cancel{180°}_{2}} = \frac{\pi}{2}$

$270° \cdot \frac{\pi}{180°} = \frac{3\pi}{2}$

$180° \cdot \frac{\pi}{180°}$

$360° \cdot \frac{\pi}{180°} = 2\pi$

"ALL STUDENTS TAKE CALCULUS"

To convert from degrees to radians: multiply by $\frac{\pi}{180^\circ}$

To convert from radians to degrees: mult. by $\frac{180^\circ}{\pi}$

unit circle: $x^2+y^2=1 \Rightarrow \cos^2\theta+\sin^2\theta=1$

Pythagorean Identity: $\sin^2\theta+\cos^2\theta=1$

(Note: it is customary to write $\sin^2\theta$ instead of $(\sin\theta)^2$ and $\cos^2\theta$ instead of $(\cos\theta)^2$.)

$\sin\left(-\frac{\pi}{2}\right)=-1$

$\cos\left(-\frac{\pi}{2}\right)=0$

Exercise Set A

In 1 -8, find the sine and cosine of the given angle.

1. 90°

   $\sin 90^\circ = 1$

   $\cos 90^\circ = 0$

2. 180°

3. $-\frac{\cancel{\pi}}{2}\cdot\frac{180^\circ}{\cancel{\pi}}$

   -90°

4. 2π

5. $-\pi$

6. $\frac{3\pi}{2}$

7. -90°

8. 0°

$(x,y)\rightarrow(\cos\theta,\sin\theta)$

In 9-12, the coordinates of a point on the unit circle are given. If the terminal side of angle θ in standard position passes through the given point, find $\sin\theta$, $\cos\theta$ and $\tan\theta$.

9. $\left(\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2}\right)$

10. $\cos\theta$ $\sin\theta$

    $\left(\frac{1}{2},-\frac{\sqrt{3}}{2}\right)$

    $\tan\theta=\frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}}=-\frac{\sqrt{3}}{\cancel{2}}\cdot\cancel{2}=-\sqrt{3}$

11. $\left(-\frac{1}{3},\frac{2\sqrt{2}}{3}\right)$

12. $\left(-\frac{\sqrt{2}}{3},-\frac{\sqrt{7}}{3}\right)$

Given the values of $\sin\theta$, $\cos\theta$ and or $\tan\theta$, determine the quadrant in which θ lies.

13. $\sin\theta=-\frac{1}{4},\cos\theta=-\frac{\sqrt{15}}{4}$

    QIII

S A

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14. $\sin\theta=\frac{2}{3},\tan\theta=-\frac{2\sqrt{5}}{5}$

15. $\sin\theta=\frac{3}{4},\cos\theta=\frac{\sqrt{7}}{4}$

16. $\cos\theta=\frac{2\sqrt{5}}{5},\tan\theta=-\frac{1}{2}$

Given the value of $\sin\theta$, $\cos\theta$ or $\tan\theta$ and the quadrant in which θ lies, find the value of the other two functions.

17. $\sin\theta=\frac{\sqrt{2}}{2}$, Quadrant I

18. $\sin\theta=-\frac{1}{2}$, Quadrant IV

19. $\cos\theta=\frac{1}{4}$, Quadrant IV

20. $\cos\theta=-\frac{4}{5}$, Quadrant II

21. $\sin\theta = -\frac{5}{13}$, Quadrant III

22. $\cos\theta = \frac{24}{25}$, Quadrant I

Evaluate.

23. $\sin\pi \cdot \cos\frac{\pi}{2}$

$\sin 180^\circ \cdot \cos 90^\circ = 0 \cdot 0 = 0$

24. $\sin\pi + \cos\pi$

25. $\cos\frac{3\pi}{2} - \sin\frac{\pi}{2}$

26. $\sin^2\frac{3\pi}{2}$

27. $\cos^2\frac{\pi}{2} + \cos^2\left(-\frac{\pi}{2}\right)$

28. $\sin\left(-\frac{\pi}{2}\right) \cdot \cos 2\pi$

29. If $\overset{+}{\tan\theta}$ is positive and $\overset{-}{\cos\theta}$ is negative, in which quadrant does θ terminate?

QIII

30. If $\tan\theta < 0$ and $\sin\theta > 0$, in which quadrant does θ terminate?

31. If $\cos\theta < 0$ and $\tan\theta > 0$, in which quadrant does θ lie?

32. If $\sin\overset{-}{\theta} < 0$ and $\cos\overset{-}{\theta} < 0$, in which quadrant does θ terminate?

QIII

33. If $\cos\theta > 0$ and $(\cos\theta)(\sin\theta) < 0$, in which quadrant does θ lie?

34. If $\tan A > 0$ and $(\tan A)(\sin A) > 0$, in what quadrant does $\angle A$ lie?