

Name: \_\_\_\_\_ Per: \_\_\_\_\_ Date: \_\_\_\_\_

Serafino · Precalculus S1

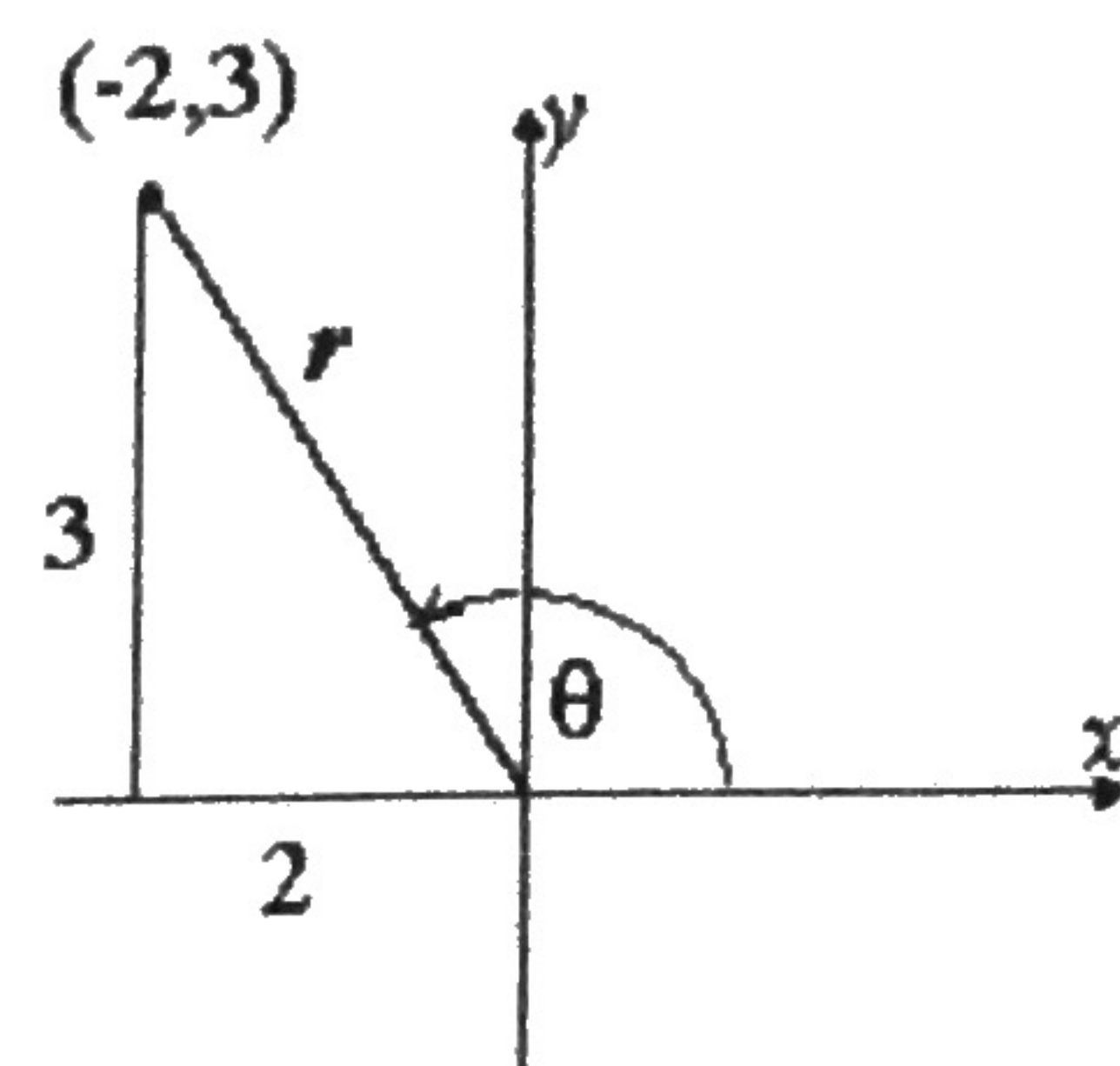
**2A3 Solving Trig Functions (using Inverses and  $\hat{\theta}$ )**

Notes / HW

Let's recall...

If  $\theta \in \text{QII}$ , sine will be \_\_\_\_\_ and cosine is \_\_\_\_\_.If  $\theta \in \text{QIV}$ , sine will be \_\_\_\_\_ and cosine is \_\_\_\_\_.If  $\theta \in \text{QIII}$ , tan will be \_\_\_\_\_ because sine and cosine are \_\_\_\_\_. Cool.

But....

If I said the "cosine of  $\theta$  is positive"... what Quadrant is  $\theta$  in? \_\_\_\_\_If I said "tangent is  $-2$ ", then what Quadrant is  $\theta$  in? \_\_\_\_\_If I said "the sine of  $\theta$  is 0"..... What is  $\theta$ ? \_\_\_\_\_ ... we have a problem.**TRIG FUNCTIONS:** To get the trig ratio, you evaluate at any angle (in standard position)**INVERSE TRIG FUNCTIONS:** To get an angle, evaluate at a trig ratio.. so you'll need the inverse trig function.We can take the  $\tan^{-1}(-3/2)$  ... but you get  $-56.31^\circ$ . That's not something you can use meaningfully. So...By ONLY USING POSITIVE RATIOS in INVERSE Trig Func., you'll get  $\rightarrow$  REFERENCE ANGLE

You then place that reference angle in the correct Quadrant(s) to solve the problem.

... so instead we will take  $\tan^{-1}(3/2)$  and we get  $\theta' = 56.31^\circ$ . Place it in QII, so  $180^\circ - 56.31^\circ = 123.69$ 1. For the following, find the solution(s) for  $0^\circ \leq \theta < 360^\circ$ 

a.  $\sin \theta = 2/9 \in \text{QII}$

d.  $\theta$  intersects  $(11, -3)$

b.  $\cos \theta = -7/8 \in \text{QIII}$

e.  $\csc \theta = -3$  in QII

c.  $\sec \theta = 1/2$  in QIV

f.  $\cot \theta = -2.34$  in QII

1. Find the solution(s) for the angles,  $0^\circ \leq \theta < 360^\circ$ . If

a. Terminal side of  $\theta$  intersects  $(\sqrt{2}, 4)$

d.  $\cos \theta = -0.8541$

b.  $\tan \theta = -\frac{3}{4}$  and  $\theta$  lies in QIV

e.  $\cot \theta = -1.6003$

c.  $\cos \theta = 3.8637$  and  $\theta \in \text{QIV}$

f.  $\sin \theta = -0.5592$

2. Find the solution(s) for the special angles,  $0^\circ \leq \theta < 360^\circ$ . NO CALCULATOR!!!

a.  $\tan \theta = \sqrt{3}$  in QIII

d.  $\sin \theta = -1$

g.  $\tan \theta = \text{und}$

b.  $\cos \theta = -\sqrt{2}/2$  in QII

e.  $\cos \theta = 1$

h.  $\sin \theta = -\sqrt{3}/2$

c.  $\sin \theta = 1/2$  in QI

f.  $\cos \theta = 0$

i.  $\tan \theta = \text{und}$ ,  $\sin \theta < 0$



Name: Answer key  
 Serafino · Precalculus S1

Per: 3 Date: 10/26/

**2A3 Solving Trig Functions (using Inverses and  $\hat{\theta}$ )**

Notes / HW

Let's recall...

If  $\theta \in \text{QII}$ , sine will be + and cosine is -.

If  $\theta \in \text{QIV}$ , sine will be - and cosine is +

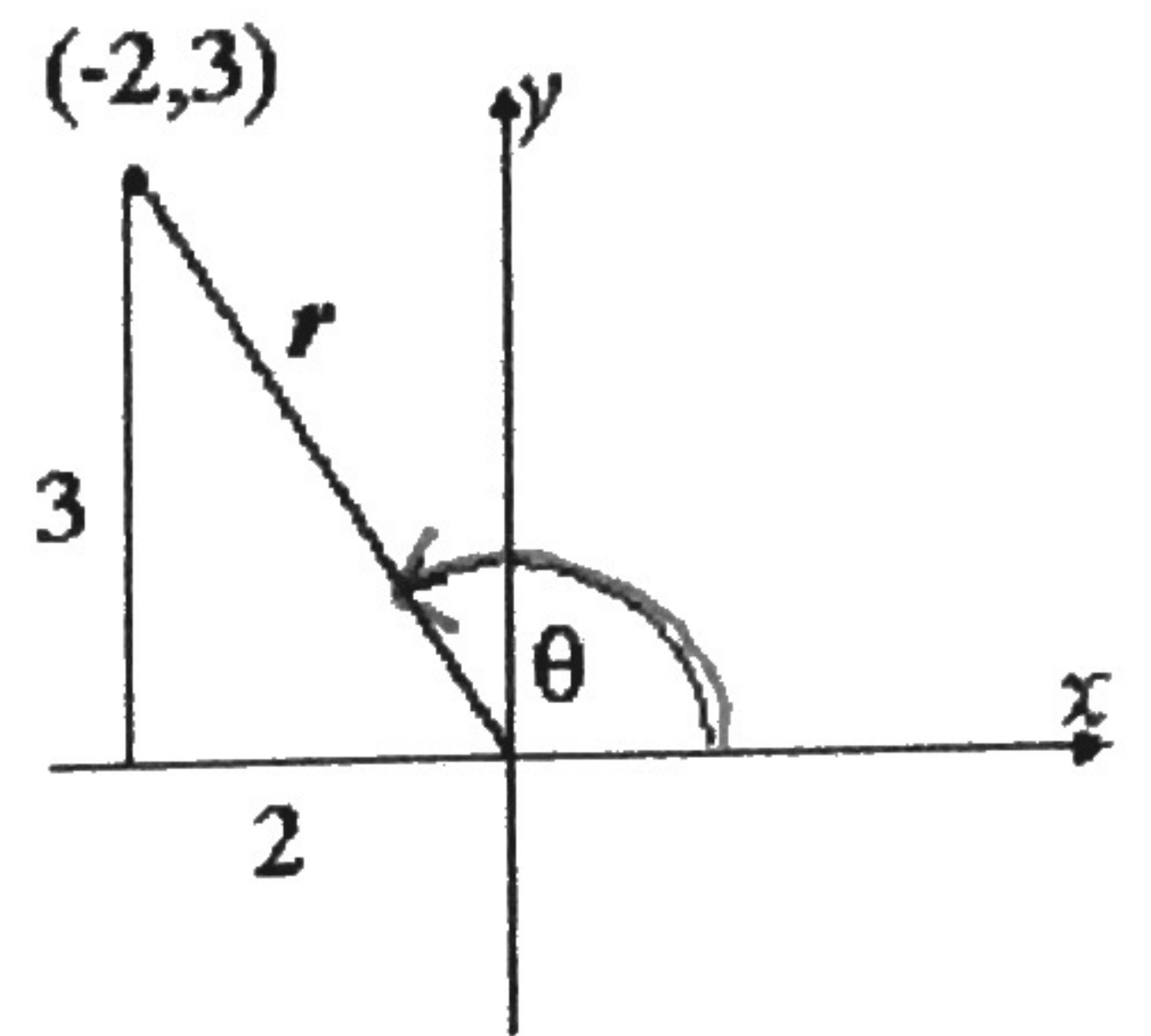
If  $\theta \in \text{QIII}$ , tan will be + because sine and cosine are -. Cool.

But....

If I said the "cosine of  $\theta$  is positive"... what Quadrant is  $\theta$  in? QI, QIV

If I said "tangent is  $-2$ ", then what Quadrant is  $\theta$  in? QII, QIV

If I said "the sine of  $\theta$  is 0"..... What is  $\theta$ ?  $0^\circ$  or  $180^\circ$ ... or coterminal ... we have a problem.



**TRIG FUNCTIONS:** To get the trig ratio, you evaluate at any angle (in standard position)

**INVERSE TRIG FUNCTIONS:** To get an angle, evaluate at a trig ratio.. so you'll need the inverse trig function.

We can take the  $\tan^{-1}(-3/2)$  ... but you get  $-56.31^\circ$ . That's not something you can use meaningfully. So...

By **ONLY USING POSITIVE RATIOS** in INVERSE Trig Func., you'll get  $\rightarrow$  REFERENCE ANGLE

You then place that reference angle in the correct Quadrant(s) to solve the problem.

... so instead we will take  $\tan^{-1}(3/2)$  and we get  $\theta' = 56.31^\circ$ . Place it in QII, so  $180^\circ - 56.31^\circ = 123.69$

1. For the following, find the solution(s) for  $0^\circ \leq \theta < 360^\circ$

a.  $\sin \theta = 2/9 \in \text{QII}$

$180 - \sin^{-1}(2/9)$

$\theta = 167.1604^\circ$



b.  $\cos \theta = -7/8 \in \text{QIII}$

$180 + \cos^{-1}(7/8)$

$\theta = 208.9550^\circ$



c.  $\sec \theta = 1/2$  in QIV

$\sec \theta = 1/2$

$\cos \theta = 2$

no solution

d.  $\theta$  intersects  $(11, -3)$

$360 - \tan^{-1}(3/11) =$

$\theta = 344.7449^\circ$



e.  $\csc \theta = -3$  in QII

$\sin \theta = -1/3$

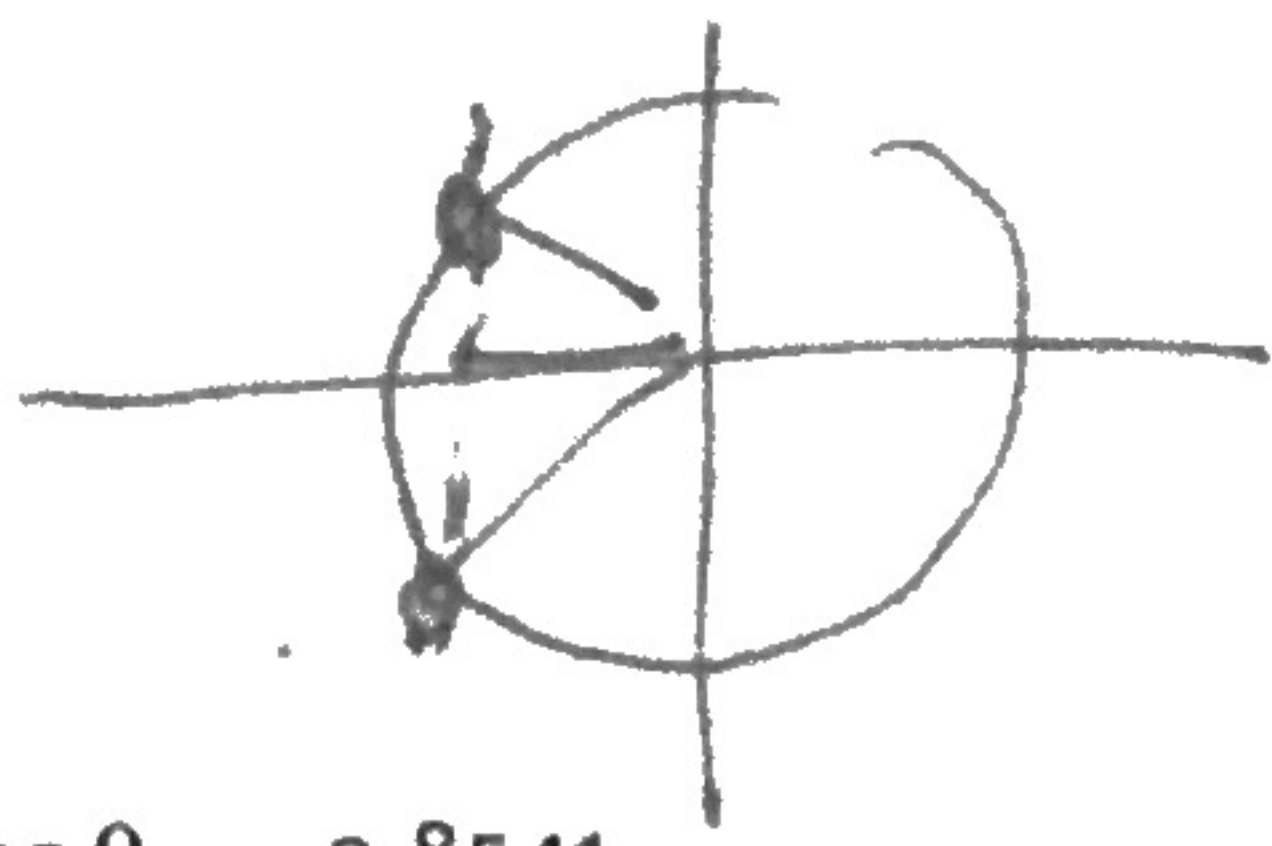
no solution  
 CSC is  $\neq$  neg. in QII !!

f.  $\cot \theta = -2.34$  in QII

$180 - \tan^{-1}(1/2.34)$

$\theta = 156.8605^\circ$





1. Find the solution(s) for the angles,  $0^\circ \leq \theta < 360^\circ$ . If

a. Terminal side of  $\theta$  intersects  $(\sqrt{2}, 4)$

$$0 + \tan^{-1}\left(\frac{4}{\sqrt{2}}\right)$$

$$\theta = 70.5288^\circ$$



d.  $\cos \theta = -0.8541$

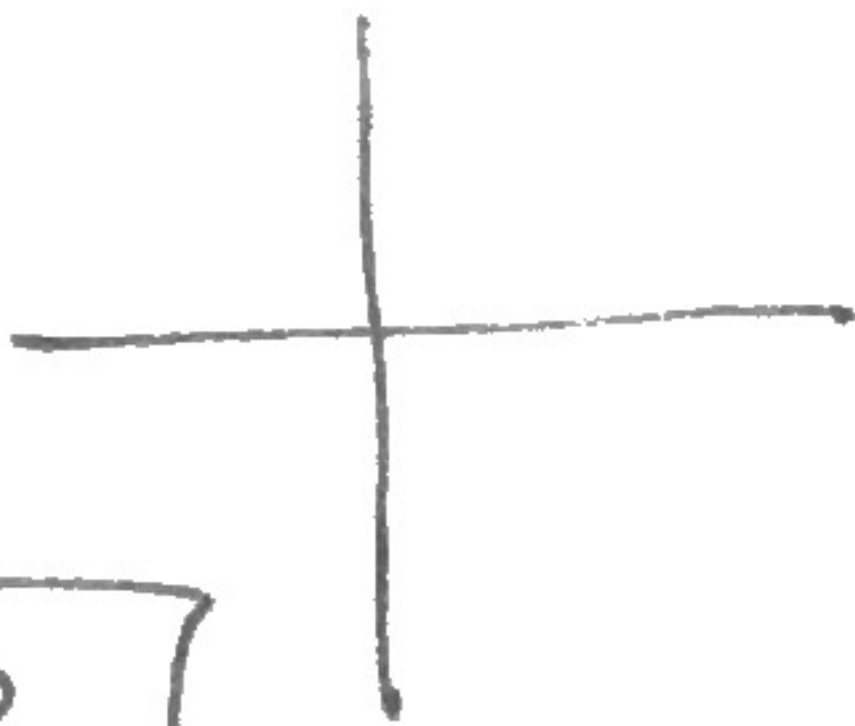
$$\theta = 148.6604^\circ$$

$$211.3396^\circ$$

b.  $\tan \theta = -\frac{3}{4}$  and  $\theta$  lies in QIV

$$360 - \tan^{-1}\left(\frac{3}{4}\right)$$

$$\theta = 323.1301^\circ$$



e.  $\cot \theta = -1.6003$

$$\tan \theta = -\frac{1}{1.6003}$$

$$180 \pm \tan^{-1}\left(\frac{1}{1.6003}\right)$$

$$\theta = 147.9994^\circ \text{ or } 327.9994^\circ$$



c.  $\cos \theta = 3.8637$  and  $\theta \in \text{QIV}$

cosine can't be  $> 1$   
so no solution

f.  $\sin \theta = -0.5592$

$$\theta = 214.0005^\circ$$

$$325.9995^\circ$$

2. Find the solution(s) for the special angles,  $0^\circ \leq \theta < 360^\circ$ . NO CALCULATOR!!!

a.  $\theta' = 60^\circ$   
 $\tan \theta = \sqrt{3}$  in QIII

$$\theta = 240^\circ$$



d.  $\sin \theta = -1$

$$\theta = 270^\circ$$

g.  $\tan \theta = \text{und}$

$$\theta = 90^\circ, 270^\circ$$

b.  $\theta' = 45^\circ$   
 $\cos \theta = -\frac{\sqrt{2}}{2}$  in QII

$$\theta = 135^\circ$$

e.  $\cos \theta = 1$

$$\theta = 0^\circ$$

h.  $\theta' = 60^\circ$   
 $\sin \theta = -\frac{\sqrt{3}}{2}$

$$\theta = 240^\circ, 300^\circ$$

c.  $\theta' = 30^\circ$   
 $\sin \theta = \frac{1}{2}$  in QI

$$\theta = 30^\circ$$

f.  $\cos \theta = 0$

$$\theta = 90^\circ, 270^\circ$$

i.  $\tan \theta = \text{und}, \sin \theta < 0$

$$\theta = 270^\circ$$