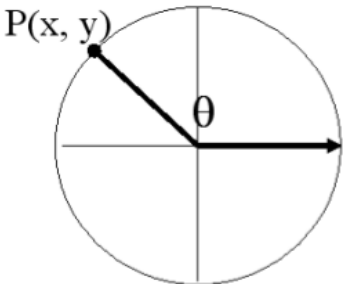
7.3 Notes

The Sine and Cosine Functions

- Used to describe repetitive patterns (i.e. sound waves)
- Sine (sin)
- Cosine (cos)

If P(x, y) is on a circle and θ is an angle in standard position, then

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



Remember an equation of circle is…
$x^2 + y^2 = r^2$

$(x-h)^2 + (y-k)^2 = r^2$

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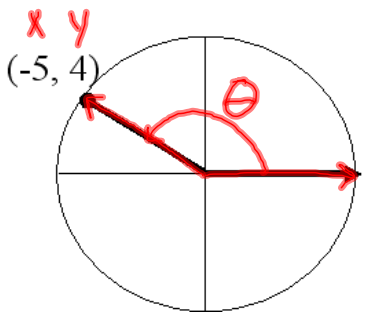
Example 1

If the terminal ray of θ in standard position passes through (-5, 4) find sinθ and cosθ.



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

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

$(-5)^2 + (4)^2 = r^2$

$25 + 16 = r^2$

$\pm\sqrt{41} = \sqrt{r^2}$ $r = \sqrt{41}$

$\sin\theta = \frac{4}{\sqrt{41}} \cdot \frac{\sqrt{41}}{\sqrt{41}} = \frac{4\sqrt{41}}{41}$

$\cos\theta = \frac{-5}{\sqrt{41}} \cdot \frac{\sqrt{41}}{\sqrt{41}} = \frac{-5\sqrt{41}}{41}$

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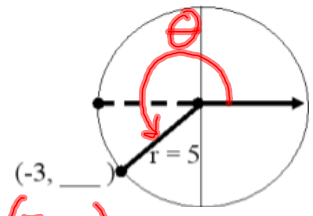
Example 2

If θ is in quadrant III and $\cos\theta = \frac{-3}{5}$ find the $\sin\theta$.



(-,-)

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

$(-3)^2 + y^2 = 5^2$

$9 + y^2 = 25$

$y^2 = \pm 16$

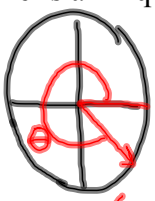
$y = \pm 4$

choose $y = -4$ 3Q

$\sin\theta = \frac{y}{r} = \frac{-4}{5}$

Example 3

If θ is a 4th quadrant angle and $\sin\theta = -\frac{5}{13}$ find $\cos\theta$.



(+,-)

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

$x^2 + (-5)^2 = 13^2$

$x^2 + 25 = 169$

$x^2 = \pm 144$

$x = 12$

Q4

$\cos\theta = \frac{x}{r} = \frac{12}{13}$

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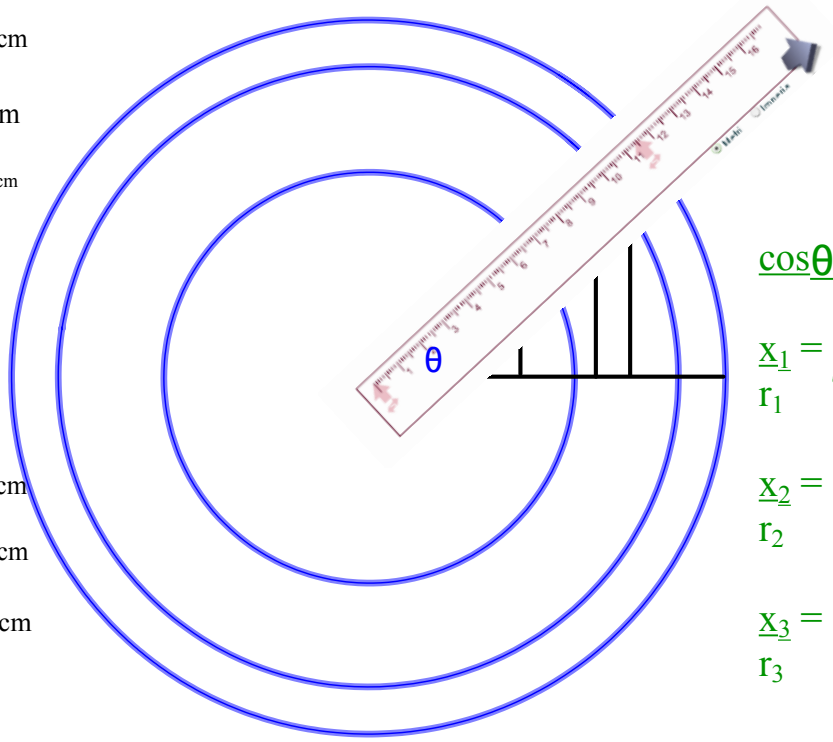
$r_1 = 6.6$ cm

$r_2 = 10$ cm

$r_3 = 11.5$ cm



$x_1 = 4.9$ cm

$x_2 = 7.3$ cm

$x_3 = 8.5$ cm

$\cos\theta$

$\frac{x_1}{r_1} = .74$

$\frac{x_2}{r_2} = .73$

$\frac{x_3}{r_3} = .74$

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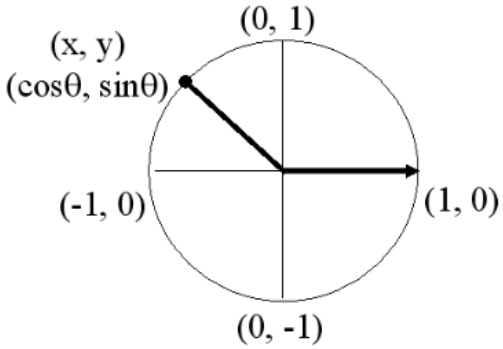
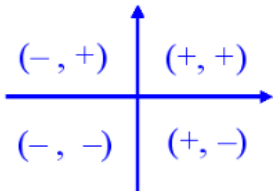
☞ The values of sinθ and cosθ depend only on θ NOT on the radius of the circle.

UNIT CIRCLE

- Radius = 1
- Equation $x^2 + y^2 = 1$
- $\sin\theta = y$
- $\cos\theta = x$
- Trig functions are called circular functions



Value of sinθ = y and cosθ = x



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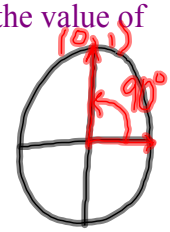
Example 4

Find the value of a) cos 90° b) sin 90°



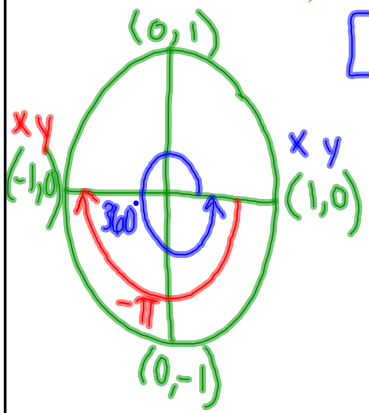
0

(0,1)
x y
cos, sin

1

Example 5

Find the value of a) cos 360° b) sin(2π) c) cos(-π)



1

$2\pi = 360$

0

$-\pi = -180°$

-1

$90° = \frac{\pi}{2}$ $270° = \frac{3\pi}{2}$

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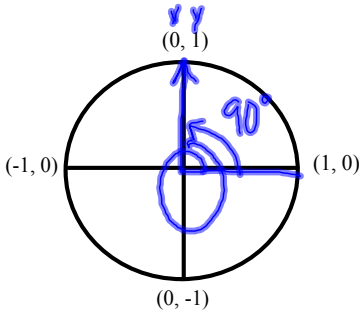
Example 6

Solve $\sin\theta = 1$ for θ in degrees and radians.



$\theta = 90°$ $\quad \theta = \frac{\pi}{2}$

$\theta = 90° \pm 360°n$

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

☞ Because the values of $\sin\theta$ and $\cos\theta$ repeat, trig functions are **PERIODIC**.

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Homework

p272 #1-7 odd
#17-20 all

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