BMC Int I 4/14/21

Warm-Up:
Write down everything you know about right triangles.

90° angle

45-45-90
30-60-90

pythagorean theorem
$a^2+b^2=c^2$

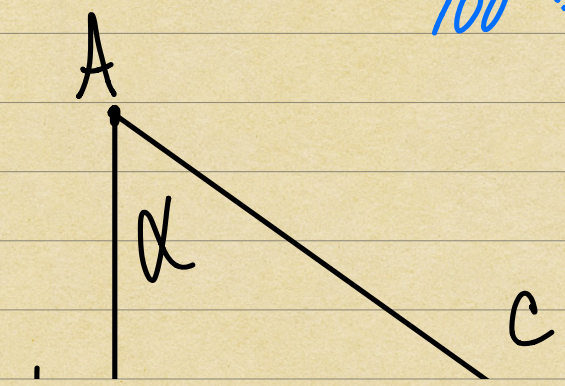
1/2 of a rectangle

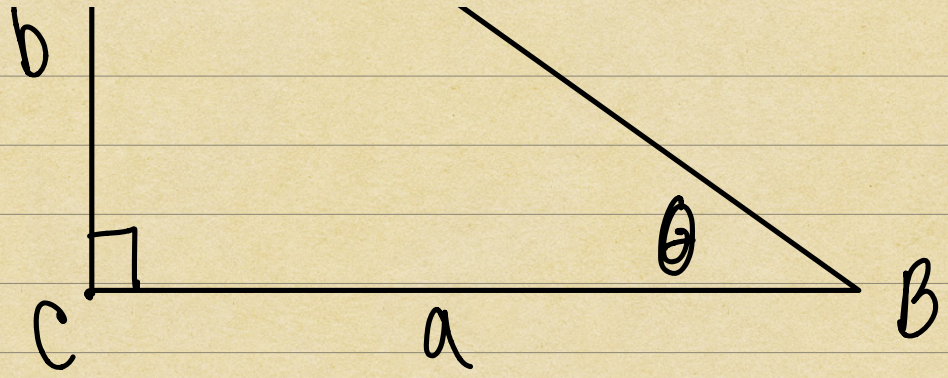
ortho center @ pt where legs meet

SOHCAHTOA Trig

Hypotenuse is longest side

180° = sum of all angles.

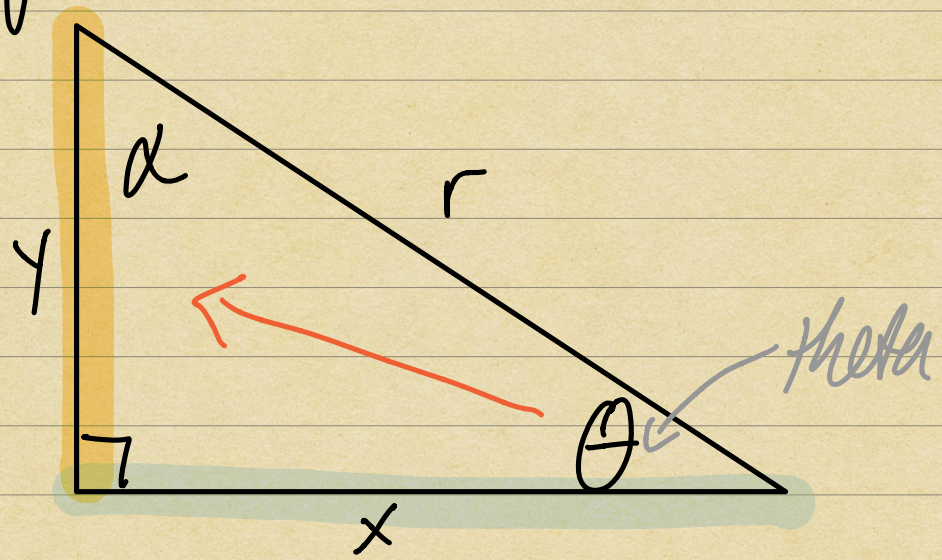




$$a^2 + b^2 = c^2$$

Trigonometry: the study of triangles.

Trigonometric Ratios:

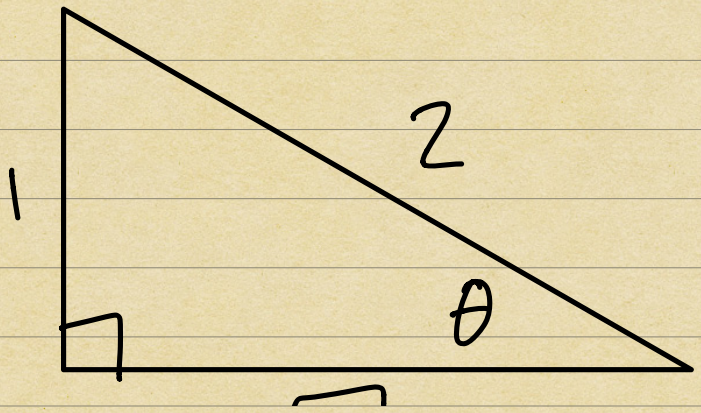


$\sin(\theta) = \frac{y}{r}$ (opposite side : hypotenuse)

$\cos(\theta) = \frac{x}{r}$ (adjacent side : hypotenuse)

$\tan(\theta) = \frac{y}{x} = \frac{\sin(\theta)}{\cos(\theta)}$

SOH CAH TOA



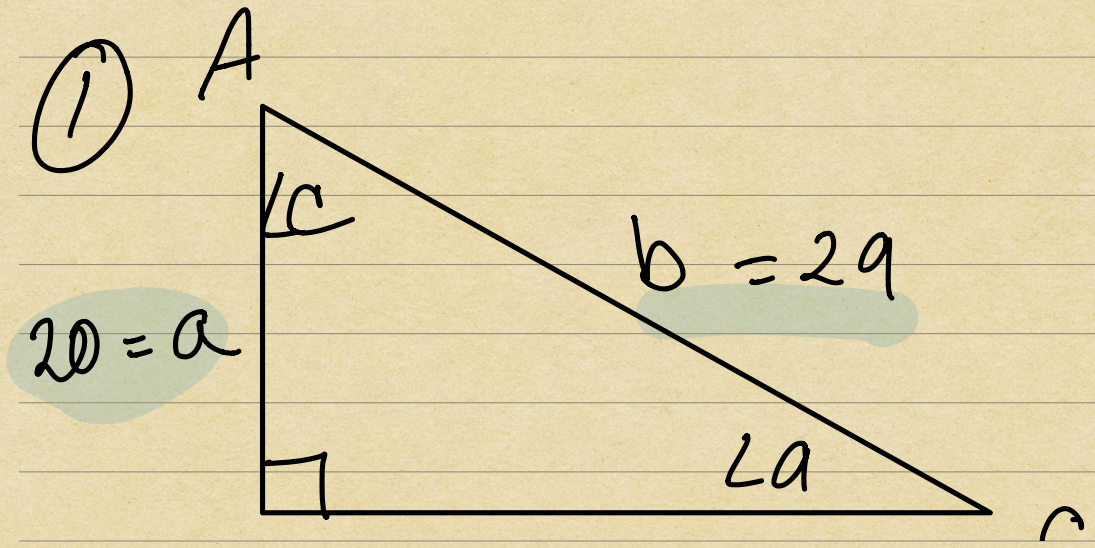
$\sqrt{3}$'

$\sin(\theta) = \frac{1}{2}$ $\cos(\theta) = \frac{\sqrt{3}}{2}$

$\theta = \sin^{-1}\left(\frac{1}{2}\right)$ $\theta = \cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

$\theta = \arcsin\left(\frac{1}{2}\right)$ $\theta = \arccos\left(\frac{\sqrt{3}}{2}\right)$

[Problems # 1 - 5]

① 

B $c = 21$

$$(20)^2 + (21)^2 = b^2$$

$b = 29$ un.

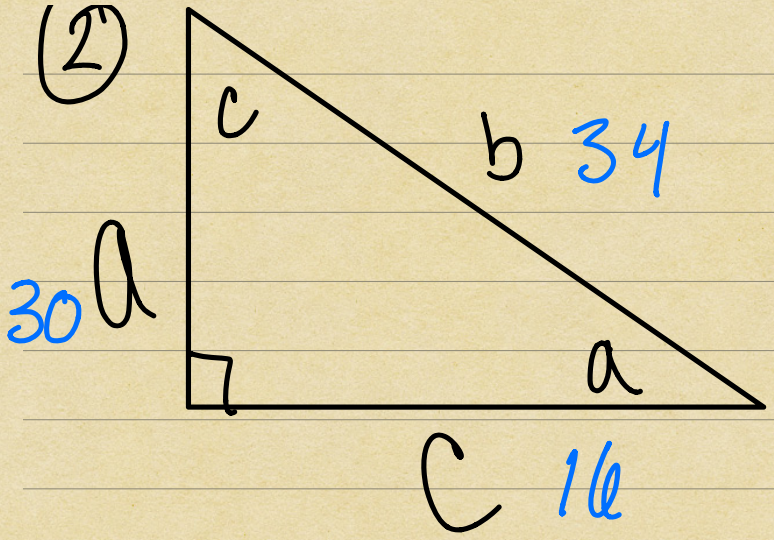
$$\cos(C) = \frac{20}{29}$$

$$C = \arccos\left(\frac{20}{29}\right)$$

$$\boxed{\angle C = 46.4^\circ}$$

$$\boxed{\angle A = 43.6^\circ}$$

(2)

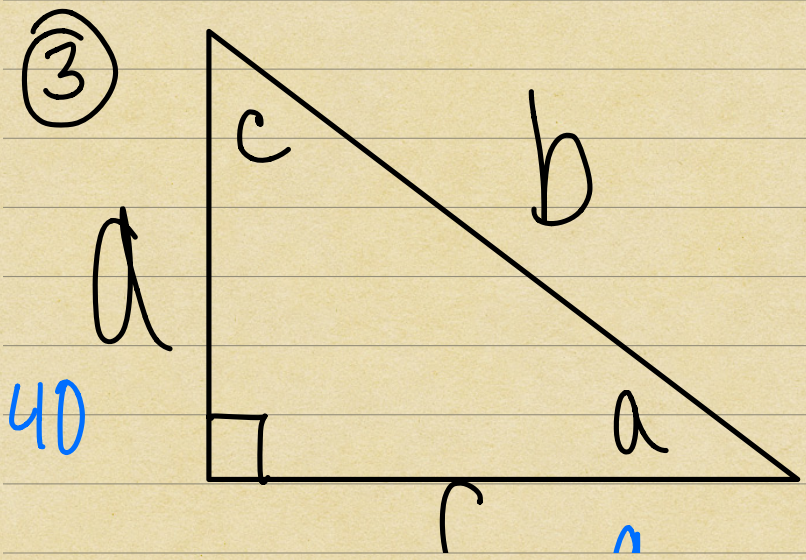


Prajwal

$\sin(a) = \frac{15}{17}$ $\cos(a) = \frac{8}{17}$

$\angle C = 28.08°$ $\angle A = 61.92°$

(3)



Carissa

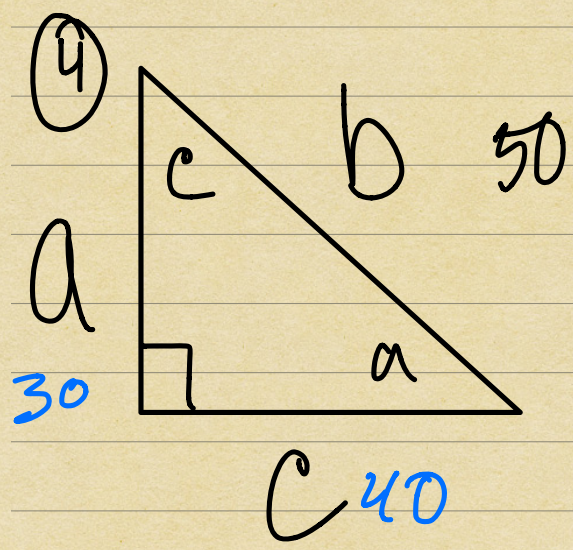
$\smile$ 4

$b = 41$

$\sin(a) = \frac{40}{41}$ $\cos(a) = \frac{9}{41}$

$\cos(c) = \frac{40}{41}$ $\sin(c) = \frac{9}{41}$

$\therefore \sin(a) = \cos(c)$ $\therefore \sin(c) = \cos(a)$



Maxwell

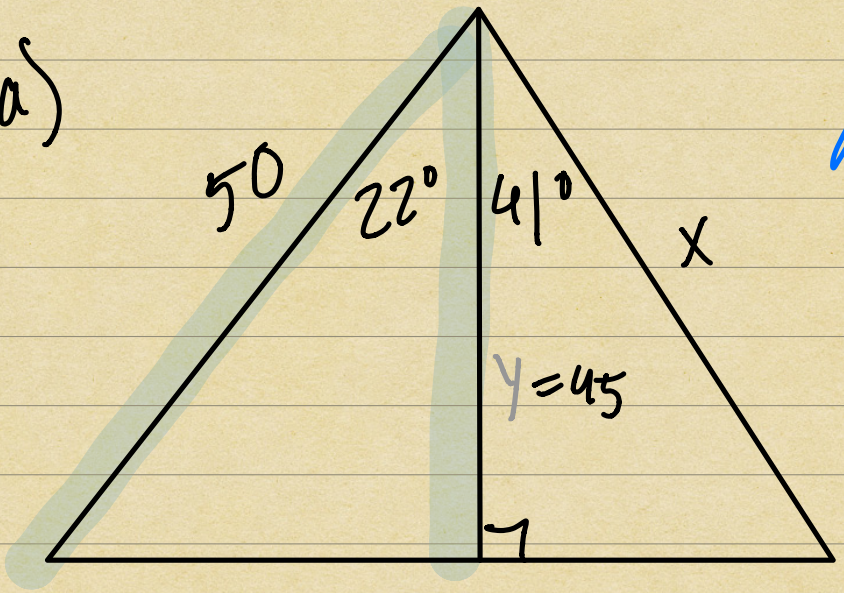
$\sin(a) = \frac{3}{5}$ $\cos(a) = \frac{4}{5}$

$\tan(a) = \frac{3}{4}$

$\angle A = 36.8699°$ $\angle C = 53.1301°$

$\therefore \sin(x) = \cos(90 - x)$

(5) a)



Jann
Carissa

$$\cos(22^\circ) = \frac{y}{50}$$

$$0.9 = \frac{y}{50}$$

$$y = 45$$

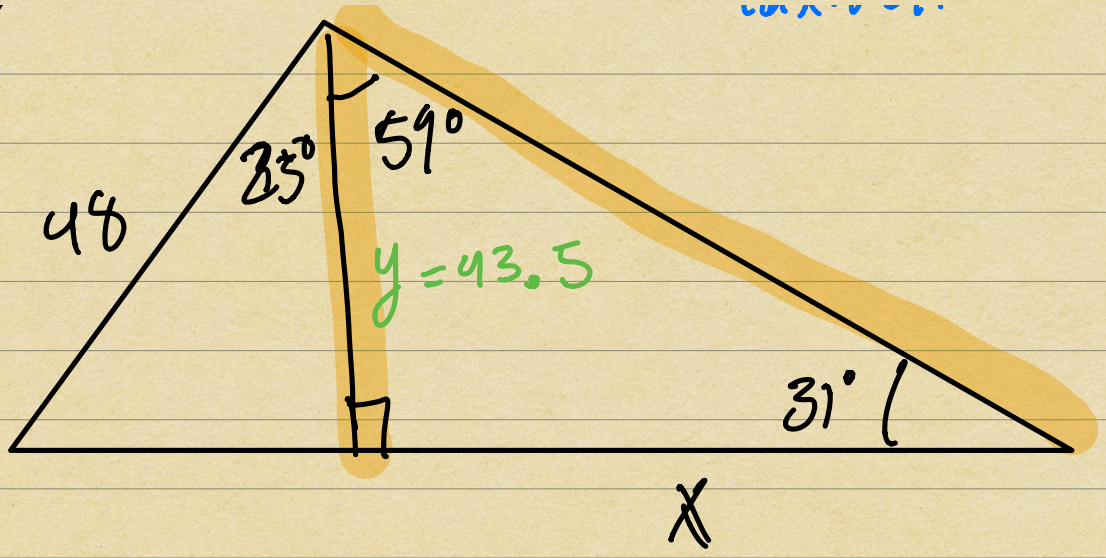
$$\cos(41^\circ) = \frac{45}{x}$$

$$0.8 = \frac{45}{x}$$

$$\boxed{x = 56.25}$$

b)

Marvell



$\cos(25°) = 0.906$

$\cos(25°) = \frac{y}{48}$

$0.906 = \frac{y}{48}$

$y = 48(0.906)$

$y = 43.503$

$y = 43.5$

Sage

$$\sin(31^\circ) = \frac{43.5}{x}$$

$$x = \frac{43.5}{\sin(31^\circ)} = 57.5$$

Prajwal

$$\tan(59^\circ) = \frac{x}{y}$$

opposite / adjacent

TOA

$$\tan(59^\circ) = \frac{x}{43.5}$$

$$x = 43.5\,(\tan(59^\circ))$$

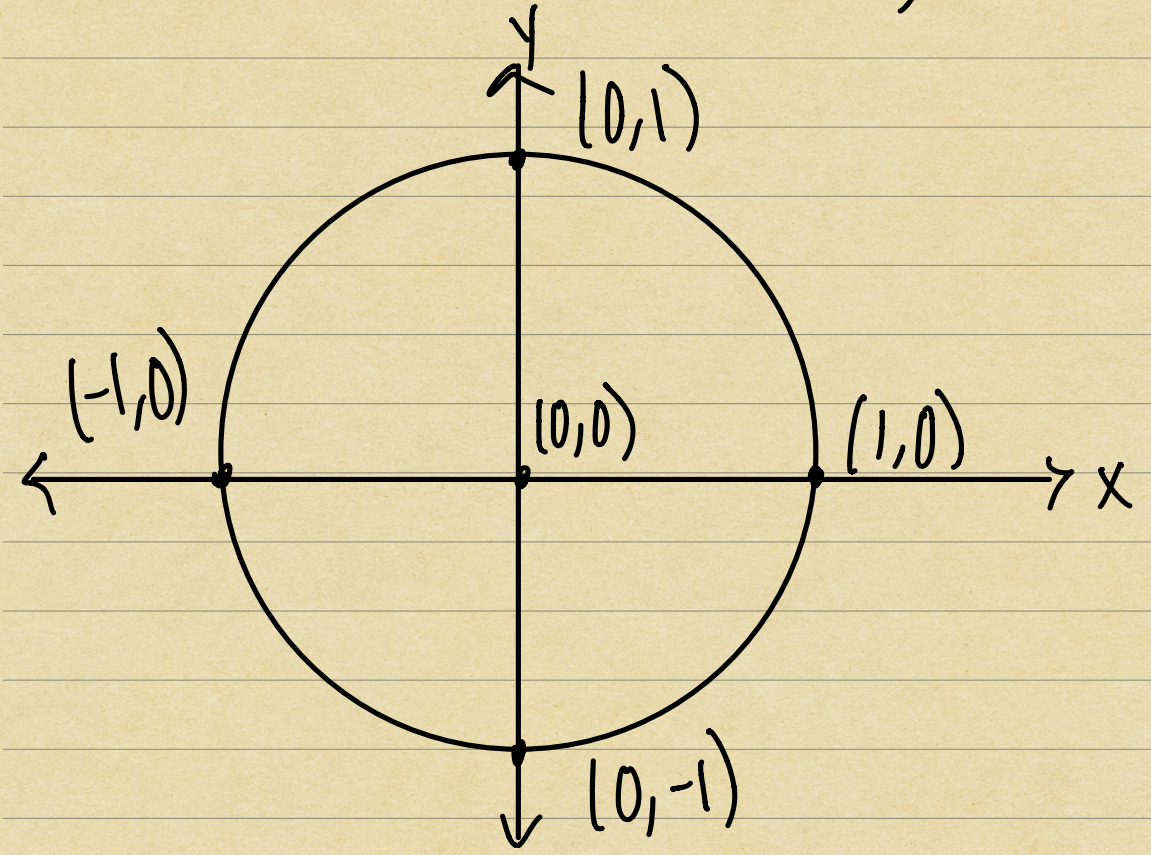
$$\boxed{x = 73.95}$$

The Unit Circle

a circle with radius 1

$$x^2 + y^2 = 1$$

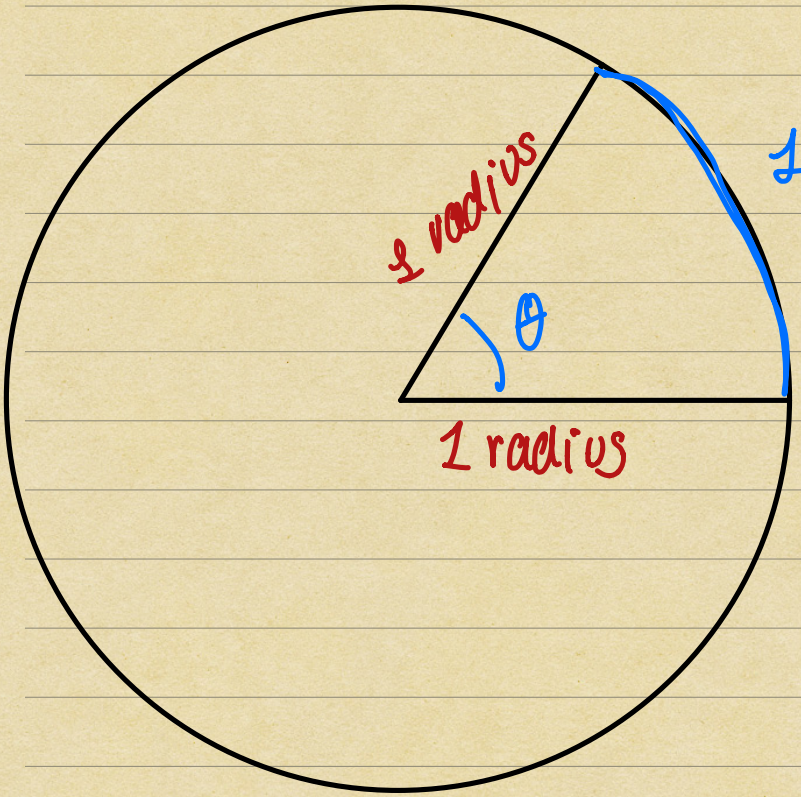
center is at (0,0)



360° in a circle.

(measuring portions of 360°)

radians: how much of the radius fits into the given arc of the circle.



2π radians in a circle.

Arc length is directly proportional to the radius.

$$s = r \cdot \theta$$ (radians)

arc length

$360^\circ = 2\pi$ radians

$180^\circ = \pi$ radians

$$(\text{radian}) = (\text{degrees}) \cdot \frac{\pi \text{ rad}}{180^\circ}$$

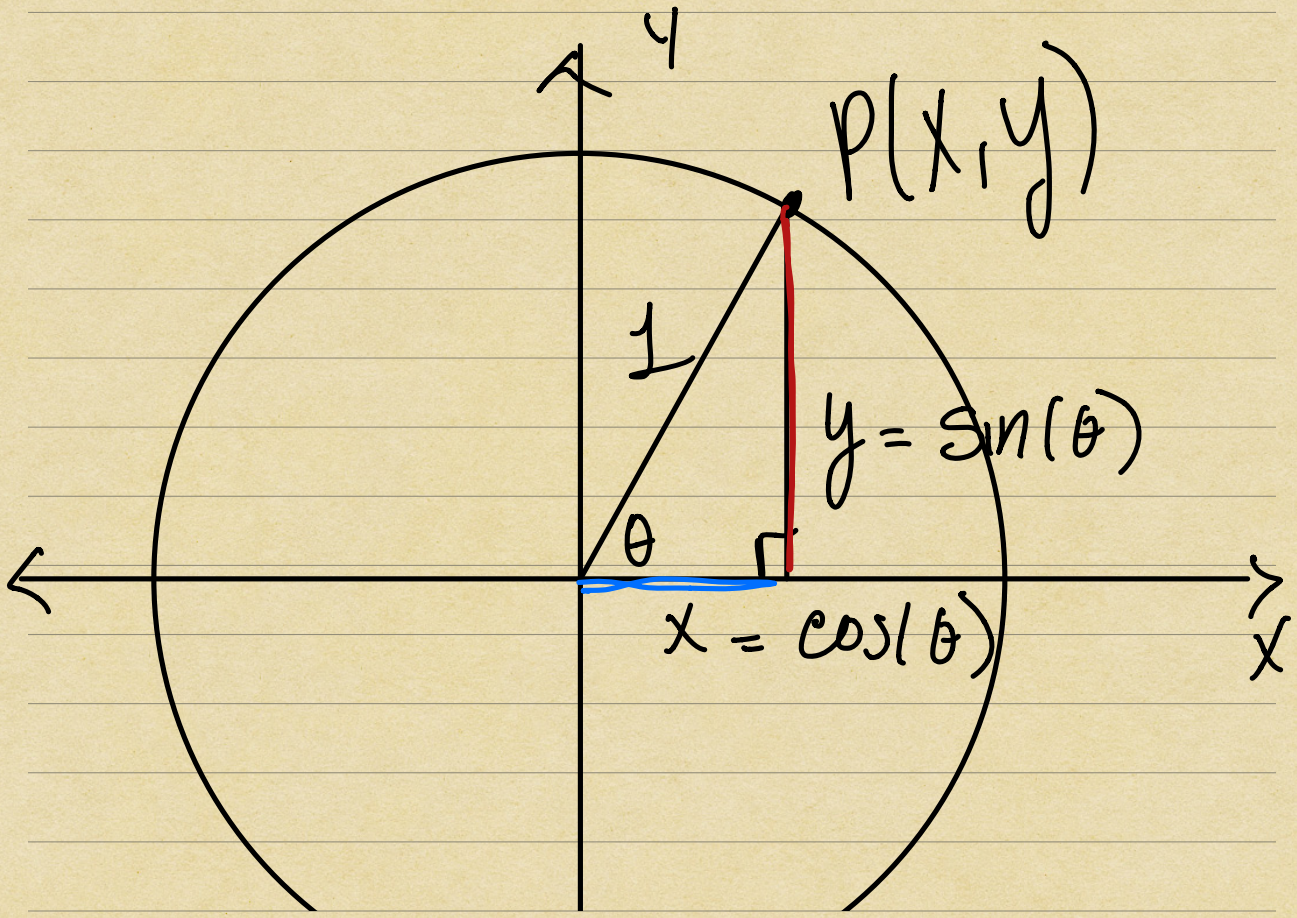
$$(\text{degrees}) = (\text{radian}) \cdot \frac{180^\circ}{\pi \text{ rad}}$$

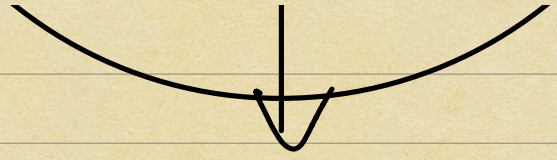
[problems #6, 7]

⑦ i) 2.3

$$\theta = 2.3 \cdot \frac{180}{\pi}$$

$$\theta = 131.78^\circ$$





$$\sin(\theta) = \frac{y}{r} \qquad \cos(\theta) = \frac{x}{1}$$

$$\sin(\theta) = y \qquad \cos(\theta) = x$$

$$P(x,y) = P\left(\cos(\theta), \sin(\theta)\right)$$

*Given that $x^2 + y^2 = r^2$,

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

prove that $\cos^2(\theta) + \sin^2(\theta) = 1$.