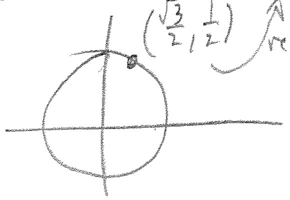
Homework 8 MATH 1540 Spring 2020

#9) $\sin^{-1}\left(-\frac{1}{2}\right)$ find y-coord $\frac{1}{2}$ $\theta = \pi/3$

report the angle

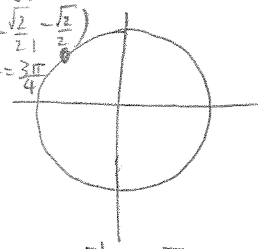
Soln:



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

#11) $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$ find x-coord $-\frac{\sqrt{2}}{2}$ → report angle

Soln:

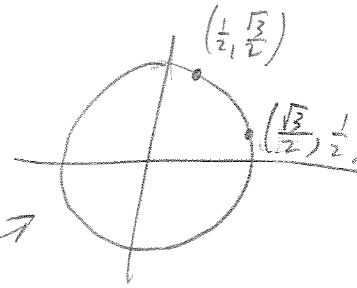


$$\cos^{-1}(-\sqrt{2}/2) = 3\pi/4$$

#15) $\tan^{-1}(\sqrt{3})$

Soln: Consider some options...

must report angle whose tangent is exactly $\sqrt{3}$ ...



We observe from the picture that

$$\tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$$

#18) Using calculator,

$$\arcsin(0.23) \approx 0.2320 \text{ radians}$$

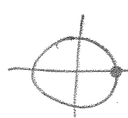
$$\text{OR} \approx 13.3^\circ$$

#24) $\sin^{-1}(\cos(\pi)) = \sin^{-1}(-1) = -\frac{\pi}{2}$

$(0,-1)$

$\theta = -\frac{\pi}{2}$

#25) $\tan^{-1}(\sin(\pi)) = \tan^{-1}(0) = 0$



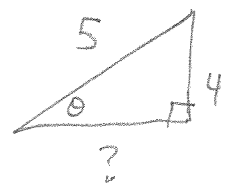
$(1,0)$ $\theta = 0$

$\tan(0) = \frac{0}{1} = 0$

#32) $\cos\left(\sin^{-1}\left(\frac{4}{5}\right)\right)$

Soln: Let $\theta = \sin^{-1}(4/5)$ so $\sin(\theta) = 4/5$.

Draw a Δ:



$\Rightarrow$ Pythagorean thm

$?^2 + 4^2 = 5^2$

$?^2 = 25 - 16$

$? = \sqrt{9} = 3$

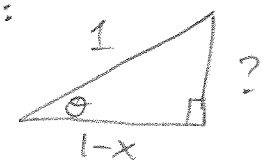
$$\Rightarrow \cos(\sin^{-1}(4/5)) = \cos(\theta)$$

$$= \frac{3}{5}$$

#38 $\sin(\cos^{-1}(1-x))$

Soln: Let $\theta = \cos^{-1}(1-x)$, so $\cos(\theta) = 1-x$.

Draw a Δ:



$\longrightarrow$ Pythagorean thm says

$$(1-x)^2 + ?^2 = 1$$

$$? = \sqrt{1-(1-x)^2}$$

$$= \sqrt{1-(1-2x+x^2)}$$

$$= \sqrt{2x-x^2}$$

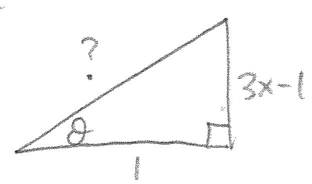
Therefore,

$$\sin(\cos^{-1}(1-x)) = \sin(\theta)$$

$$= \frac{\sqrt{2x-x^2}}{1}$$

#40 $\cos(\tan^{-1}(3x-1))$

Soln: Let $\theta = \tan^{-1}(3x-1)$ so $\tan(\theta) = 3x-1$. Draw a Δ:



$\longrightarrow$ Pythagorean thm says

$$1^2 + (3x-1)^2 = ?^2$$

$$\sqrt{1+9x^2-6x+1} = ?$$

$$\sqrt{9x^2-6x+2} = ?$$

Therefore,

$$\cos(\tan^{-1}(3x-1)) = \cos(\theta)$$

$$= \frac{1}{\sqrt{9x^2-6x+2}}$$

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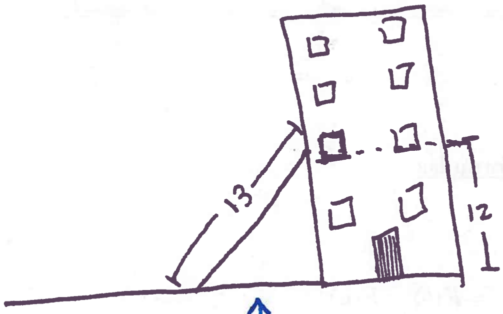
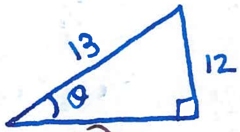


triangle



?

don't need

$\Rightarrow \sin(\theta) = \frac{12}{13}$

$\Rightarrow$ Take $\sin^{-1}$ of both sides to get

$$\cancel{\sin^{-1}(\sin}(\theta)) = \sin^{-1}\left(\frac{12}{13}\right)$$

inverse functions cancel: $\cancel{f^{-1}}(f(x)) = x$

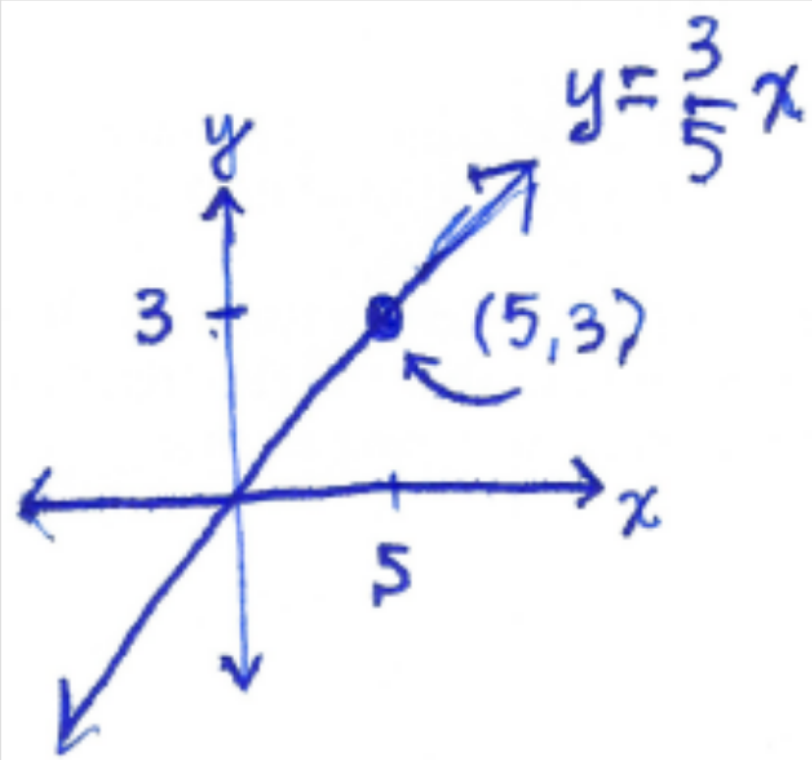
~~$\sin^{-1}(\sin$~~

$$\theta = \sin^{-1}\left(\frac{12}{13}\right)$$

calculator $\approx$ 1.176 radians

Section 8.3 #58: The line $y = \frac{3}{5}x$ passes through the origin in the xy-plane. What is the measure of the angle that the line makes with the positive x-axis?

Solution: Draw this graph and place a point on the graph. For example, if $x = 5$ then $y = 3$ giving us the point $(5, 3)$:



The right triangle with bottom leg 5 and right leg 3 is clear. If θ is the angle at the origin, then we see

$$\tan(\theta) = \frac{3}{5},$$

hence

$$\theta = \tan^{-1}\left(\frac{3}{5}\right) \approx 0.5404 \,\text{radians}.$$