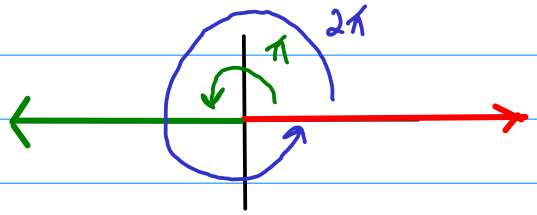
1) $A = 0.70$, $B = 0.87$ 2) $A = 1.1$, $B = 0.46$

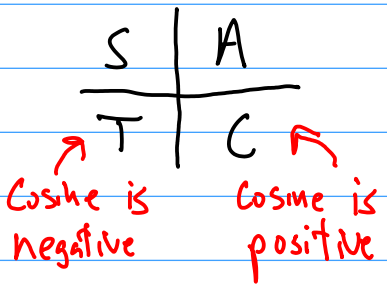
3) $x = 4.0$ 4) $x = -0.13$ 5) $x = 1.2$

6) $12/5$ 7) $-\sqrt{10}/10$ 8) $4\sqrt{13}/13$

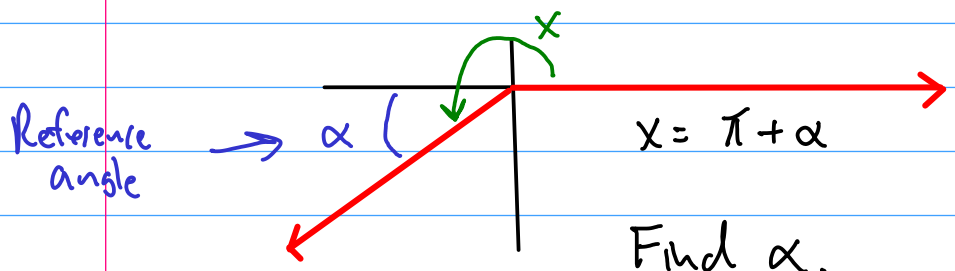
3) $\cos(x) = -0.62$ $\quad \pi \le x \le 2\pi$



The terminal side of x is in quadrant 3 or 4.



The terminal side of x is in quadrant 3 since $\cos(x)$ is negative.



Find α.

$\cos(x) = -0.62$

$\cos(\alpha) = 0.62 = |\cos(x)|$

$0 < \alpha < \pi/2$

$\alpha = \cos^{-1}(0.62) = 0.90$

$0.62 \xrightarrow{\cos^{-1}(0.62)} \alpha$

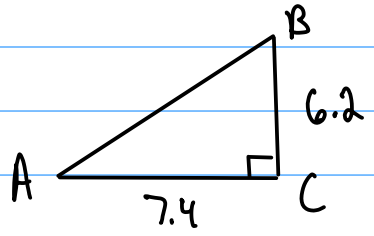
$[-1, 1] \qquad [0, \pi]$

$0.62 \xleftarrow[\cos(\alpha)]{} \alpha$

$x = \pi + 0.90$

$= 4.0$

1) $a = 6.2$, $b = 7.4$, C is a right angle



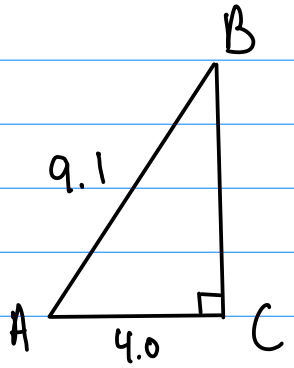
$$\tan(A) = \frac{6.2}{7.4}$$

$$A = \tan^{-1}\left(\frac{6.2}{7.4}\right) = 0.70$$

$$\tan(B) = \frac{7.4}{6.2}$$

$$B = \tan^{-1}\left(\frac{7.4}{6.2}\right) = 0.87$$

2)



$$\cos(A) = \frac{4.0}{9.1}$$

$$A = \cos^{-1}\left(\frac{4.0}{9.1}\right) = 1.1$$

$$\sin(B) = \frac{4.0}{9.1}$$

$$B = \sin^{-1}\left(\frac{4.0}{9.1}\right) = 0.46$$

5) $\cot(x) = 0.42$ $\quad 0 < x < \frac{\pi}{2}$

$$\tan(x) = \frac{1}{0.42} \qquad 0 < x < \frac{\pi}{2}$$

$\frac{1}{0.42}$ $\xrightarrow{\tan^{-1}\left(\frac{1}{0.42}\right)}$ x

$(-\infty, \infty)$ $\qquad$ $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

$\frac{1}{0.42}$ $\xleftarrow{\tan(x)}$ x

$$x = \tan^{-1}\left(\frac{1}{0.42}\right) = 1.2$$

6) $\tan\left(\cos^{-1}\left(-\frac{5}{13}\right)\right)$

$$\theta = \cos^{-1}\left(-\frac{5}{13}\right)$$

We want to find $\tan(\theta)$.

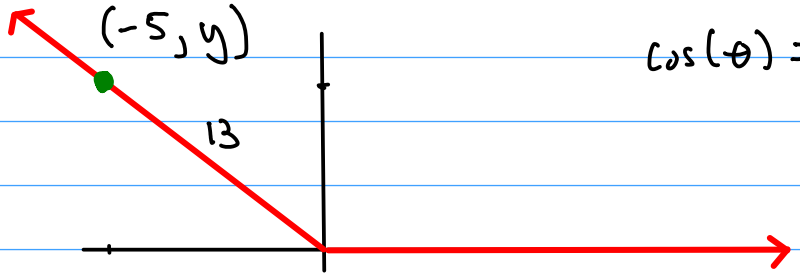
$$-\frac{5}{13} \xrightarrow{\cos^{-1}} \theta \qquad 0 \le \theta \le \pi$$

$$[-1, 1] \qquad [0, \pi]$$

$$-\frac{5}{13} \xleftarrow{\cos} \theta \qquad \cos(\theta) = -\frac{5}{13}$$

$\cos(\theta) = -\frac{5}{13}$ $\quad 0 \le \theta \le \pi$

The terminal side of θ is in quadrant 1 or 2.
The terminal side of θ is in quadrant 2 since $\cos(\theta)$ is negative



$$\cos(\theta) = \frac{x}{r} = \frac{-5}{13}$$

$$x^2 + y^2 = r^2$$
$$(-5)^2 + y^2 = 13^2$$
$$y^2 = 13^2 - 52$$
$$y^2 = 144$$
$$y = 12$$

$$\tan\left(\cos^{-1}\left(-\frac{5}{13}\right)\right) = \tan(\theta) = \frac{y}{x} = -\frac{12}{5}$$

7) $\sin\left(\tan^{-1}\left(-\frac{1}{3}\right)\right)$

$\theta = \tan^{-1}\left(-\frac{1}{3}\right)$

$\tan^{-1}$: $(-\infty, \infty) \to \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

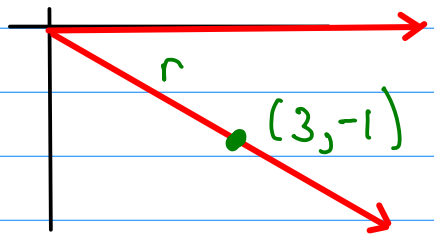
$\tan$: $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \to (-\infty, \infty)$

$\tan(\theta) = -\frac{1}{3}$

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

S | A	tangent positive
T | C	tangent negative

↖ Terminal side of θ in quadrant 4.



$\tan(\theta) = \frac{y}{x} = \frac{-1}{3}$

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

$3^2 + (-1)^2 = r^2$

$10 = r^2$

$r = \sqrt{10}$

$\sin\left(\tan^{-1}\left(-\frac{1}{3}\right)\right) = \sin(\theta) = \frac{y}{r} = \frac{-1}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = -\frac{\sqrt{10}}{10}$

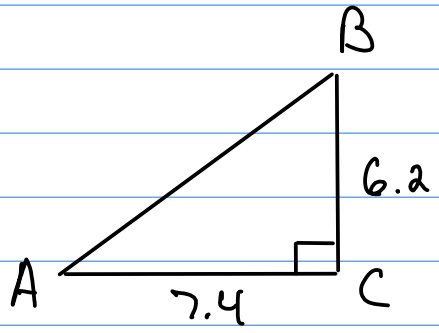
Homework 18 Solutions

1) $A = 0.70$, $B = 0.87$ 2) $A = 1.1$, $B = 0.46$

3) $x = 4.0$ 4) $x = -0.13$ 5) $x = 1.2$

6) $12/5$ 7) $-\sqrt{10}/10$ 8) $4\sqrt{13}/13$

1)



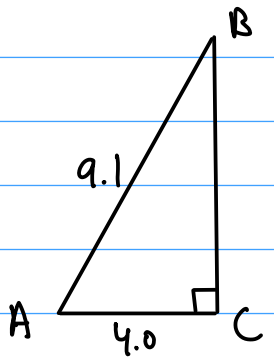
$$\tan(A) = \frac{6.2}{7.4}$$

$$A = \tan^{-1}\left(\frac{6.2}{7.4}\right) = 0.70$$

$$\tan(B) = \frac{7.4}{6.2}$$

$$B = \tan^{-1}\left(\frac{7.4}{6.2}\right) = 0.87$$

2)



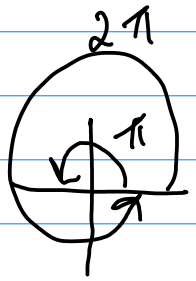
$$\cos(A) = \frac{4.0}{9.1}$$

$$A = \cos^{-1}\left(\frac{4.0}{9.1}\right) = 1.1$$

$$\sin(B) = \frac{4.0}{9.1}$$

$$B = \sin^{-1}\left(\frac{4.0}{9.1}\right) = 0.46$$

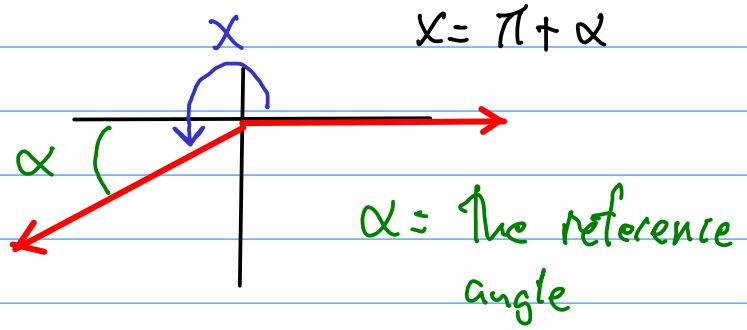
3) $\cos(x) = -0.62$ $\quad \pi \le x \le 2\pi$



S	A
T	C

Cosine − Cosine +

The terminal side of x is in quadrant 3.



$\cos(x) = -0.62$

$\cos(\alpha) = |-0.62| = 0.62$

$0 < \alpha < \frac{\pi}{2}$ (α is acute)

$0.62 \longrightarrow \cos^{-1}(0.62)$

$[-1, 1] \qquad [0, \pi]$

$\cos(\alpha) \longleftarrow \alpha$

$\alpha = \cos^{-1}(0.62) = 0.90$

$x = \pi + 0.90 = 4.0$

4) $\csc(x) = -7.5 \qquad -\frac{\pi}{2} \le x \le \frac{\pi}{2}$

$\sin(x) = -\frac{1}{7.5} \qquad -\frac{\pi}{2} \le x \le \frac{\pi}{2}$

$$-\frac{1}{7.5} \xrightarrow{\sin^{-1}\left(-\frac{1}{7.5}\right)} x$$

$$[-1, 1] \qquad \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$

$$-\frac{1}{7.5} \xleftarrow{\sin(x)} x$$

$$x = \sin^{-1}\left(-\frac{1}{7.5}\right) \approx -0.13$$

5) $\cot(x) = 0.42 \qquad 0 < x < \frac{\pi}{2}$

$\tan(x) = \frac{1}{0.42} \qquad 0 < x < \frac{\pi}{2}$

$$\frac{1}{0.42} \xrightarrow{\tan^{-1}\left(\frac{1}{0.42}\right)} x$$

$$(-\infty, \infty) \qquad \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$

$$\frac{1}{0.42} \xleftarrow{\tan(x)} x$$

$$x = \tan^{-1}\left(\frac{1}{0.42}\right) \approx 1.2$$

6) $\tan\left(\cos^{-1}\left(-\frac{5}{13}\right)\right)$

$$\theta = \cos^{-1}\left(-\frac{5}{13}\right)$$

$$-\frac{5}{13} \xrightarrow{\cos^{-1}\left(-\frac{5}{13}\right)} \theta$$

$$[-1, 1] \qquad [0, \pi]$$

$$-\frac{5}{13} \xleftarrow{\cos(\theta)} \theta$$

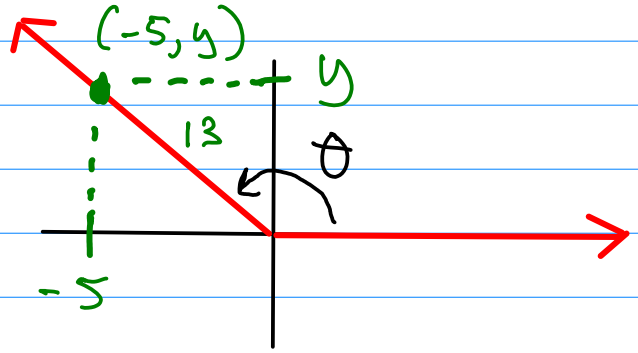
$\cos(\theta) = -\frac{5}{13}$ $\quad 0 \le \theta \le \pi$

↑ Negative

Cosine − Cosine +

S	A
T	C

$\frac{\pi}{2} < \theta < \pi$



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

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

$y^2 = 13^2 - 5^2$

$y^2 = 144$

$y = 12$

$\tan\left(\cos^{-1}\left(-\frac{5}{13}\right)\right) = \tan(\theta) = -\frac{12}{5}$

7) $\sin\left(\tan^{-1}\left(-\frac{1}{3}\right)\right)$

$\theta = \tan^{-1}\left(-\frac{1}{3}\right)$

$-\frac{1}{3}$ $\xrightarrow{\tan^{-1}\left(-\frac{1}{3}\right)}$ θ

$(-\infty, \infty)$ $\qquad$ $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

$-\frac{1}{3}$ $\xleftarrow{\tan(\theta)}$ θ

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

$\tan(\theta) = -\frac{1}{3}$

1) The terminal side of θ is in quadrant 1 or quadrant 4.

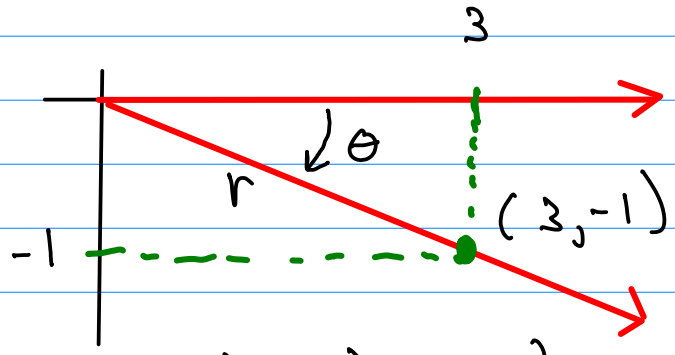
2) $\tan(\theta)$ is negative

S	A
T	C

← tangent positive

← tangent negative

The terminal side of θ is in quadrant 4.



$$\tan(\theta) = -\frac{1}{3} = \frac{-1}{3}$$

$$r^2 = 3^2 + (-1)^2$$

$$r^2 = 10$$

$$r = \sqrt{10}$$

$$\sin\left(\tan^{-1}\left(-\frac{1}{3}\right)\right) = \sin(\theta) = \frac{-1}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = -\frac{\sqrt{10}}{10}$$

8) $\sec\left(\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)\right)$

$$\theta = \sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$$

$\frac{\sqrt{3}}{4}$ $\quad \sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$ $\quad \theta$

$[-1, 1] \rightleftarrows \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

$\frac{\sqrt{3}}{4}$ $\quad \sin(\theta)$ $\quad \theta$

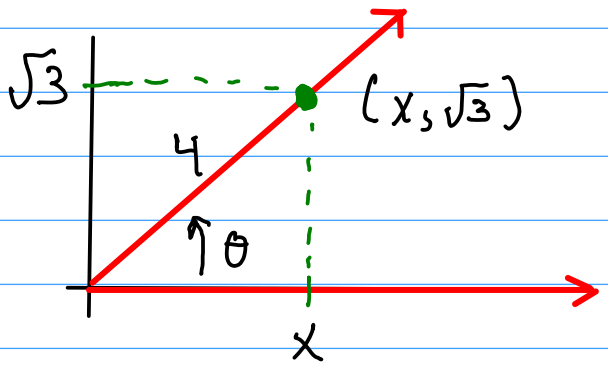
$\sin(\theta) = \frac{\sqrt{3}}{4}$ $\qquad -\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$

S	A
T	C

$\sin(\theta)$ positive

Terminal side of θ in quadrant I

$0 < \theta < \frac{\pi}{2}$



$\sin(\theta) = \frac{\sqrt{3}}{4} = \frac{y}{r}$

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

$x^2 + (\sqrt{3})^2 = 4^2$

$x^2 = 16 - 3 = 13$

$x = \sqrt{13}$

$\sec\left(\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)\right) = \sec(\theta) = \frac{4}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{4\sqrt{13}}{13}$

Document License

CC BY-SA 4.0

License Links

License summary: https://creativecommons.org/licenses/by-sa/4.0/

License legal code: https://creativecommons.org/licenses/by-sa/4.0/legalcode