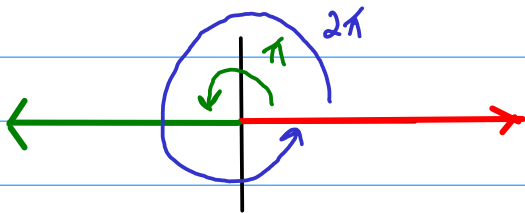


1) $A = 0.70$, $B = 0.87$ 2) $A = 1.1$, $B = 0.46$

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) $\cos(x) = -0.62$ $\pi \leq x \leq 2\pi$

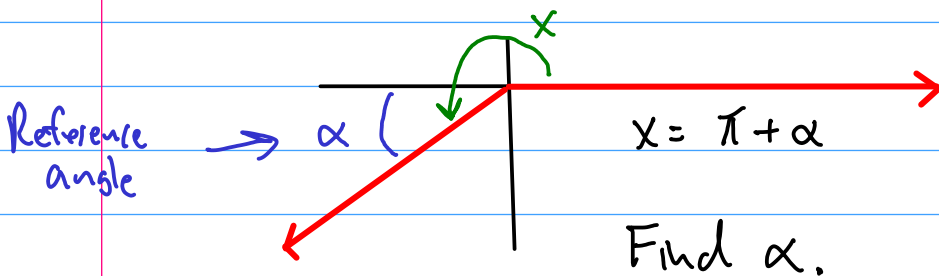


The terminal side of x is in quadrant 3 or 4.

S	A
T	C

↖ ↗
Cosine is negative Cosine is positive

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



$$\cos(x) = -0.62$$

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

$$0 < \alpha < \pi/2$$

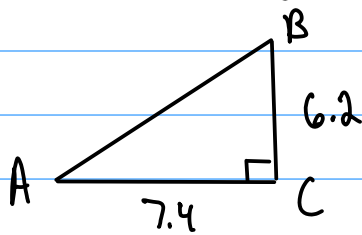
$$\alpha = \cos^{-1}(0.62) = 0.90$$

$$[-1, 1] \quad \xrightarrow{\cos^{-1}(0.62)} \quad [0, \pi]$$

$$0.62 \quad \xleftarrow{\cos(\alpha)} \quad \alpha$$

$$x = \pi + 0.90 = 4.0$$

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



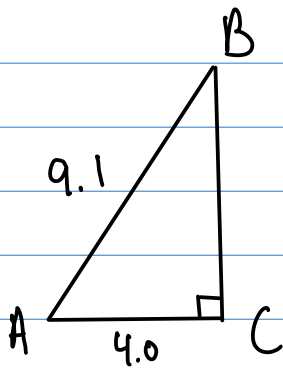
$$\tan(A) = \frac{6.2}{7.4}$$

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

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

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

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) $\cot(x) = 0.42$

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

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

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

$$\begin{array}{ccc} \frac{1}{0.42} & \tan^{-1}\left(\frac{1}{0.42}\right) & x \\ \left(-\infty, \infty\right) & \longrightarrow & \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \\ \frac{1}{0.42} & \longleftarrow \tan(x) & x \end{array}$$

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

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

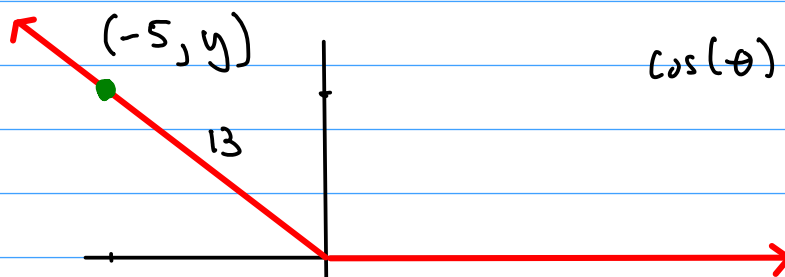
$$\theta = \cos^{-1}\left(-\frac{5}{13}\right)$$

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

$$\begin{array}{ccc} -\frac{5}{13} & \xrightarrow{\cos^{-1}} & \theta \\ [-1, 1] & & [0, \pi] \\ -\frac{5}{13} & \xleftarrow{\cos} & \theta \end{array} \quad \left. \begin{array}{l} 0 \leq \theta \leq \pi \\ \cos(\theta) = -\frac{5}{13} \end{array} \right\}$$

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

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



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

$$\begin{aligned} x^2 + y^2 &= r^2 \\ (-5)^2 + y^2 &= 13^2 \\ y^2 &= 13^2 - 5^2 \\ y^2 &= 144 \\ y &= 12 \end{aligned}$$

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

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

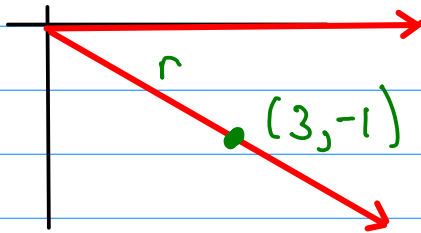
$$\theta = \tan^{-1} \left(-\frac{1}{3} \right)$$

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

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

S	A	tangent positive
F	C	tangent negative

↑ Terminal side of θ in quadrant 4.



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

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

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

$$10 = r^2$$

$$r = \sqrt{10}$$

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

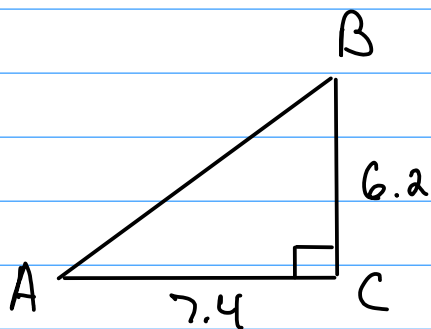
Homework 18 Solutions

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)



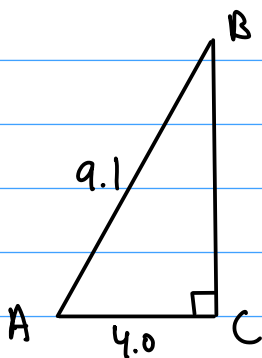
$$\tan(A) = \frac{6.2}{7.4}$$

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

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

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

2)



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

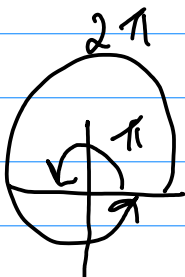
$$A = \cos^{-1}\left(\frac{4.0}{9.1}\right) = 1.1$$

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

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

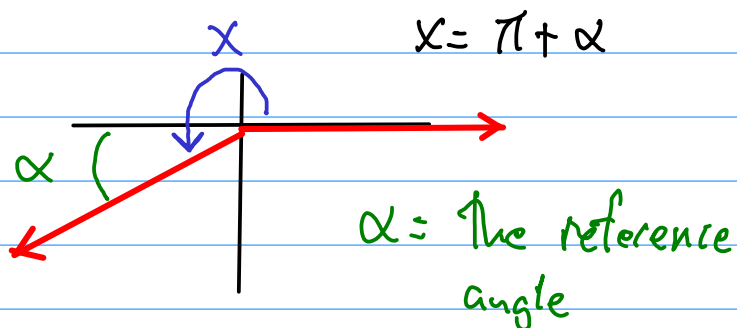
3) $\cos(x) = -0.62$

$$\pi \leq x \leq 2\pi$$



S	A
T	C
Cosine -	Cosine +

The terminal side of x is in quadrant 3.



$$\cos(x) = -0.62$$

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

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

$$\begin{array}{ccc} 0.62 & \longrightarrow & \cos^{-1}(0.62) \\ [-1, 1] & & [0, \pi] \\ \cos(\alpha) & \longleftarrow & \alpha \end{array}$$

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

$$x = \pi + 0.90 = 4.0$$

$$4) \quad \csc(x) = -7.5 \quad -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$$

$$\sin(x) = -\frac{1}{7.5} \quad -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$$

$$\begin{array}{ccc}
 -\frac{1}{7.5} & \xrightarrow{\sin^{-1}\left(-\frac{1}{7.5}\right)} & x \\
 [-1, 1] & & \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \\
 -\frac{1}{7.5} & \xleftarrow{\sin(x)} & x
 \end{array}$$

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

$$\begin{array}{ll}
 5) \quad \cos(x) = 0.42 & 0 < x < \frac{\pi}{2} \\
 \tan(x) = \frac{1}{0.42} & 0 < x < \frac{\pi}{2}
 \end{array}$$

$$\begin{array}{ccc}
 \frac{1}{0.42} & \xrightarrow{\tan^{-1}\left(\frac{1}{0.42}\right)} & x \\
 (-\infty, \infty) & & \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \\
 \frac{1}{0.42} & \xleftarrow{\tan(x)} & x
 \end{array}$$

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

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

$$\begin{array}{ccc}
 \theta = \cos^{-1}\left(-\frac{5}{13}\right) & & \\
 -\frac{5}{13} & \xrightarrow{\cos^{-1}\left(-\frac{5}{13}\right)} & \theta \\
 [-1, 1] & & [0, \pi] \\
 -\frac{5}{13} & \xleftarrow{\cos(\theta)} & \theta
 \end{array}$$

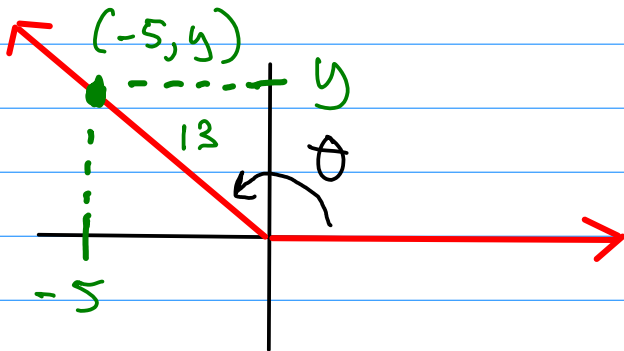
$$\cos(\theta) = -\frac{5}{13} \quad 0 \leq \theta \leq \pi$$

↑ Negative

cosine - cosine +

S	A
T	C

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



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

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

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

$$y^2 = 144$$

$$y = 12$$

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

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

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

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

$$(-\infty, \infty) \xrightarrow{\tan^{-1}(-\frac{1}{3})} (-\frac{\pi}{2}, \frac{\pi}{2})$$

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

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

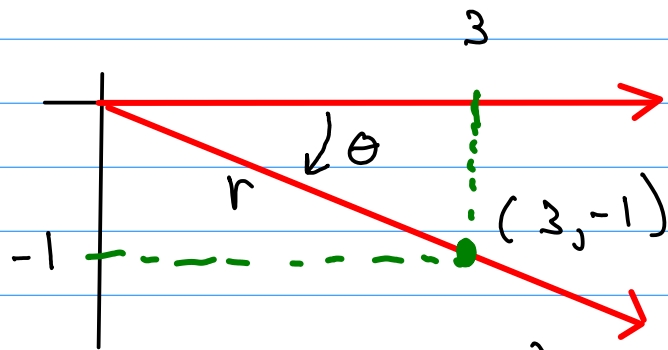
$$\tan(\theta) = -\frac{1}{3}$$

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

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

S	A	← tangent positive
T	C	← tangent negative

The terminal side of θ is in quadrant 4.



$$\begin{aligned}\tan(\theta) &= -\frac{1}{3} \\ &= \frac{-1}{3}\end{aligned}$$

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

$$r^2 = 10$$

$$r = \sqrt{10}$$

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

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

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

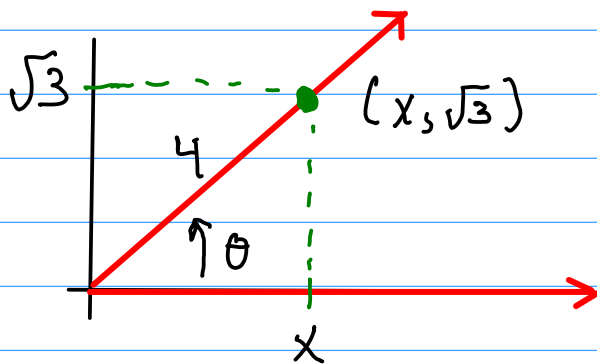
$$\begin{array}{ccc} \frac{\sqrt{3}}{4} & \sin^{-1}\left(\frac{\sqrt{3}}{4}\right) & \theta \\ [-1, 1] & \longleftrightarrow & \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \\ \frac{\sqrt{3}}{4} & \sin(\theta) & \theta \end{array}$$

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

S	A
T	C

$\sin(\theta)$ positive
Terminal side of θ in quadrant I

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



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

$$\begin{aligned} x^2 + y^2 &= r^2 \\ x^2 + (\sqrt{3})^2 &= 4^2 \end{aligned}$$

$$x^2 = 16 - 3 = 13$$

$$x = \sqrt{13}$$

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

Document License

CC BY-SA 4.0

Copyright ©2016 Scott P. Randby

This work is licensed under a [Creative Commons Attribution-Share Alike 4.0 International \(CC BY-SA 4.0\)](https://creativecommons.org/licenses/by-sa/4.0/) or later version license.

[License legal code](https://creativecommons.org/licenses/by-sa/4.0/legalcode)

License Links

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

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