Chapter 4 Review Exercises

22.

$\sin(t) = -\frac{15}{17}$	$\cos(t) = \frac{8}{17}$	$\tan(t) = -\frac{15}{8}$
$\csc(t) = -\frac{17}{15}$	$\sec(t) = \frac{17}{8}$	$\cot(t) = -\frac{8}{15}$

24. $\tan\left(\frac{4\pi}{3}\right) = \dfrac{\sin\left(\frac{4\pi}{3}\right)}{\cos\left(\frac{4\pi}{3}\right)} = \dfrac{-\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = \sqrt{3}$

26. $\cot(\pi) = \dfrac{\cos(\pi)}{\sin(\pi)} = \dfrac{-1}{0} = \text{undefined}$

28. $\tan(4.7)\cot(4.7) = \tan(4.7)\left(\dfrac{1}{\tan(4.7)}\right) = 1$

30. Rearranging one of the Pythagorean identities, it follows that $\tan^2(1.4) - \sec^2(1.4) = -1$.

32. $\sin\left(\frac{\pi}{6}\right) + \tan^2\left(\frac{\pi}{3}\right) = \frac{1}{2} + \left(\dfrac{\sin\left(\frac{\pi}{3}\right)}{\cos\left(\frac{\pi}{3}\right)}\right)^2 = \frac{1}{2} + \left(\sqrt{3}\right)^2 = \frac{1}{2} + 3 = \frac{7}{2}$

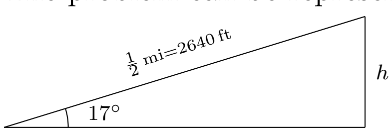
34. $\sec^2\left(\frac{\pi}{5}\right) - \tan^2\left(\frac{\pi}{5}\right) = 1$. This is a Pythagorean identity.

36. $\sin(70°) = \cos(90° - 70°) = \cos(20°)$

38. $\frac{a}{100\,\text{mm}} = \tan(23°) \quad \Rightarrow \quad a = (100\,\text{mm})\tan(23°) \approx 42.45\,\text{mm}$

40. $\frac{a}{50\,\text{in}} = \sin(48°) \quad \Rightarrow \quad a = (50\,\text{in})\sin(48°) \approx 37.16\,\text{in}$

42. The problem can be represented with the diagram below:



Since $\sin(17°) = \frac{h}{2640}$, we have that the elevation was $h = 2640\sin(17°) = 771.86\,\text{ft}$.

46. $r = \sqrt{0^2 + (-1)^2} = 1$, $x = 0$, and $y = -1$. So

$\sin(\theta) = -1$	$\cos(\theta) = 0$	$\tan(\theta) = \text{undefined}$
$\csc(\theta) = -1$	$\sec(\theta) = \text{undefined}$	$\cot(\theta) = 0$

48. If $\tan(\theta) > 0$, then θ is either in QI or QIII. If $\cos(\theta) > 0$, then θ is either in QII or QIII. Thus, if both are true, θ is in QIII.

50. If $\tan(\theta) = -\frac{1}{3} < 0$, then θ is either in QII or QIV. If $\sin(\theta) > 0$, then θ is either in QI or QII. Thus θ must be in QII. Thus, we may use the point $(-1, 3)$ for our calculations. Now $r = \sqrt{(-1)^2 + 3^2} = \sqrt{10}$, so

$\sin(\theta) = \frac{3}{\sqrt{10}} = \frac{3\sqrt{10}}{10}$	$\cos(\theta) = -\frac{1}{\sqrt{10}} = \frac{\sqrt{10}}{10}$	$\tan(\theta) = -\frac{1}{3}$
$\csc(\theta) = \frac{\sqrt{10}}{3}$	$\sec(\theta) = -\sqrt{10}$	$\cot(\theta) = -3$

54. $-410°$ is coterminal with $50°$, which is an acute angle. So $50°$ is the reference angle.

58. $\tan(120°) = \dfrac{\sin(120°)}{\cos(120°)} = \dfrac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = -\sqrt{3}$

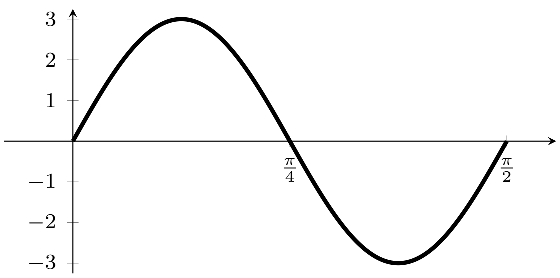
60. $\cos\left(\frac{11\pi}{6}\right) = \cos\left(-\frac{\pi}{6}\right) = \cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

62. $\csc\left(-\frac{2\pi}{3}\right) = \dfrac{1}{\sin\left(-\frac{2\pi}{3}\right)} = -\dfrac{1}{\sin\left(\frac{2\pi}{3}\right)} = -\dfrac{1}{\frac{\sqrt{3}}{2}} = -\frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

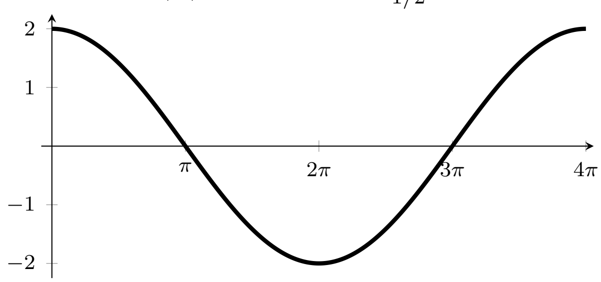
64. $\sin(495°) = \sin(495° - 360°) = \sin(135°) = \frac{\sqrt{2}}{2}$

66. $\sin\left(\frac{22\pi}{3}\right) = \sin\left(\frac{22\pi}{3} - 4\pi\right) = \sin\left(-\frac{2\pi}{3}\right) = -\sin\left(\frac{2\pi}{3}\right) = -\frac{\sqrt{3}}{2}$

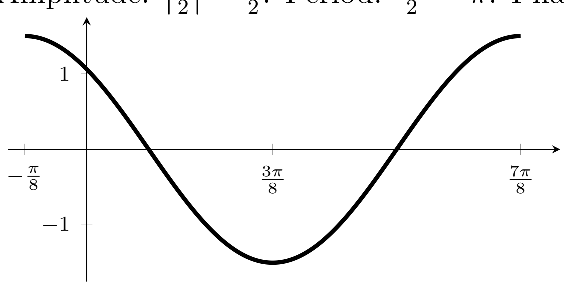
68. Amplitude: $|3| = 3$. Period: $\frac{2\pi}{4} = \frac{\pi}{2}$.



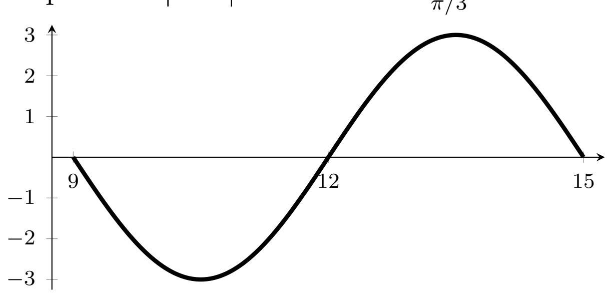
70. Amplitude: $|2| = 2$. Period: $\frac{2\pi}{1/2} = 4\pi$.



76. Amplitude: $\left|\frac{3}{2}\right| = \frac{3}{2}$. Period: $\frac{2\pi}{2} = \pi$. Phase shift: $= -\frac{\pi/4}{2} = -\frac{\pi}{8}$



78. Amplitude: $|-3| = 3$. Period: $\frac{2\pi}{\pi/3} = 6$. Phase shift: $\frac{3\pi}{\pi/3} = 9$.



94. $\sin^{-1}(1) = \frac{\pi}{2} = 90°$

96. $\tan^{-1}(1) = \frac{\pi}{4} = 45°$

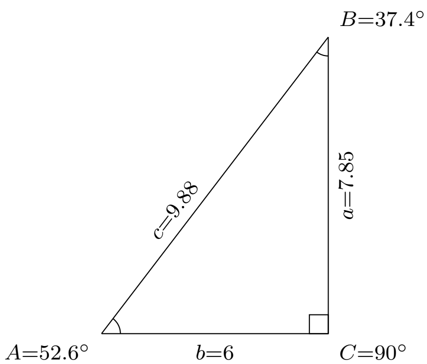
98. $\cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3} = 60°$

100. $\cos\left(\sin^{-1}\left(\frac{\sqrt{2}}{2}\right)\right) = \cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

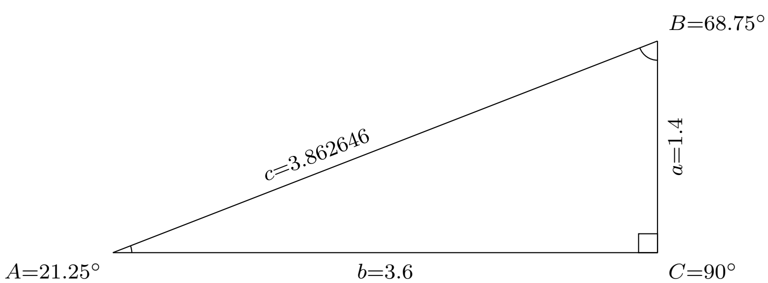
102. $\tan\left(\sin^{-1}\left(-\frac{1}{2}\right)\right) = \frac{\sin\left(\sin^{-1}\left(-\frac{1}{2}\right)\right)}{\cos\left(\sin^{-1}\left(-\frac{1}{2}\right)\right)} = \frac{-\frac{1}{2}}{\cos\left(-\frac{\pi}{6}\right)} = \frac{-\frac{1}{2}}{\frac{\sqrt{3}}{2}} = -\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

104. $\csc\left(\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)\right) = \csc\left(\frac{\pi}{6}\right) = \frac{1}{\sin\left(\frac{\pi}{6}\right)} = \frac{1}{1/2} = 2$

116.



118.



120. The building is $40 + 60\tan^{-1}(40°) = 40 + 50.35 = 90.35 \approx 90$ yd. tall.