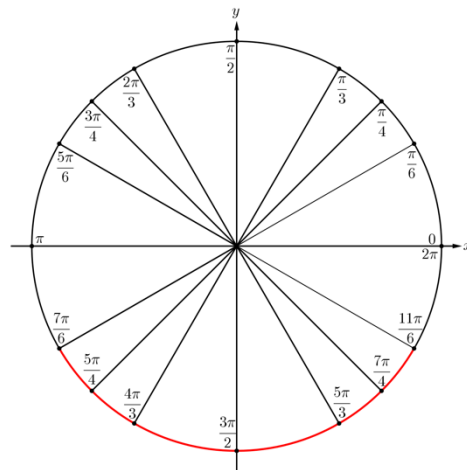


Directions: For problems 1 – 3, indicate/highlight the portion of the unit circle that satisfies the given inequality. Then, write the solution in interval notation or as an inequality.

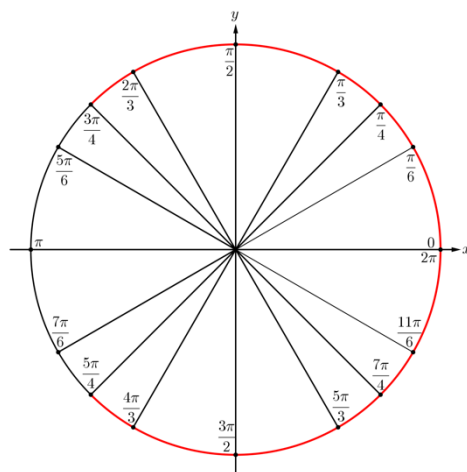
1. What are all values of θ , $0 \leq \theta < 2\pi$, for which $\sin \theta < -\frac{1}{2}$?

$$\frac{7\pi}{6} < \theta < \frac{11\pi}{6}$$



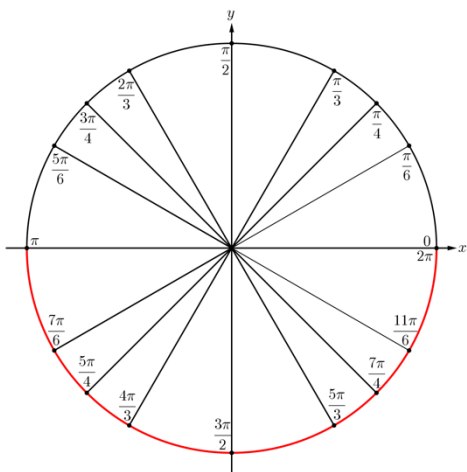
2. What are all values of θ , $0 \leq \theta < 2\pi$, for which $\cos \theta \geq -\frac{\sqrt{2}}{2}$?

$$0 \leq x \leq \frac{3\pi}{4} \quad \text{or} \quad \frac{5\pi}{4} \leq x < 2\pi$$



3. Let $f(x) = \sin x$. What are all values of x in the xy -plane, $0 \leq x \leq 2\pi$, for which $f(x) \leq 0$?

$$\pi \leq \theta \leq 2\pi \quad \text{or} \quad \theta = 0$$



4. Let $f(x) = 3 - 4\cos x$ and let $g(x) = 1$. What are all values of x in the xy -plane, $0 \leq x \leq 2\pi$, for which $f(x) < g(x)$?

$$3 - 4\cos x < 1 \quad -4\cos x < -2 \quad \cos x > \frac{1}{2} \quad 0 < x < \frac{\pi}{3} \text{ or } \frac{5\pi}{3} < x \leq 2\pi$$

5. Let $h(x) = 2\sin x$ and let $k(x) = 1 + 4\sin x$. What are all values of x in the xy -plane, $0 \leq x \leq 2\pi$, for which $h(x) \leq k(x)$?

$$2\sin x \leq 1 + 4\sin x \quad -1 \leq 2\sin x \quad \sin x \geq -\frac{1}{2} \quad 0 \leq x \leq \frac{7\pi}{6} \text{ or } \frac{11\pi}{6} \leq x \leq 2\pi$$

6. What are all values of θ , $0 \leq \theta \leq 2\pi$, for which $(2\cos\theta - 1)(2\sin\theta + 1) < 0$?

$$(2\cos\theta - 1)(2\sin\theta + 1) < 0$$

$$2\cos\theta - 1 = 0 \quad \cos\theta = \frac{1}{2} \quad \theta = \frac{\pi}{3}, \frac{5\pi}{3}$$

$$2\sin\theta + 1 = 0 \quad \sin\theta = -\frac{1}{2} \quad \theta = \frac{7\pi}{6}, \frac{11\pi}{6}$$

$$\begin{array}{c} (2\cos\theta - 1)(2\sin\theta + 1) \\ \begin{array}{ccccccc} (+) & (+) & (-)(+) & (-)(-) & (+)(-) & (+)(+) \\ \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} \\ \hline 0 & \frac{\pi}{3} & \frac{7\pi}{6} & \frac{5\pi}{3} & \frac{11\pi}{6} & 2\pi \end{array} \end{array}$$

$$\frac{\pi}{3} < \theta < \frac{7\pi}{6} \text{ or } \frac{5\pi}{3} < \theta < \frac{11\pi}{6}$$

7. What are all values of θ , $0 \leq \theta \leq 2\pi$, for which $\sin\theta(2\cos\theta - \sqrt{2}) \geq 0$?

$$(\sin\theta)(2\cos\theta - \sqrt{2}) \geq 0$$

$$\sin\theta = 0 \quad \theta = 0, \pi, 2\pi$$

$$2\cos\theta - \sqrt{2} = 0 \quad \cos\theta = \frac{\sqrt{2}}{2} \quad \theta = \frac{\pi}{4}, \frac{7\pi}{4}$$

$$\begin{array}{c} (\sin\theta)(2\cos\theta - \sqrt{2}) \\ \begin{array}{ccccccc} (+) & (+) & (+)(-) & (-)(-) & (-)(+) & (-)(+) \\ \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} \\ \hline 0 & \frac{\pi}{4} & \pi & \frac{7\pi}{4} & 2\pi \end{array} \end{array}$$

$$0 \leq \theta \leq \frac{\pi}{4} \text{ or } \pi \leq \theta \leq \frac{7\pi}{4} \text{ or } \theta = 2\pi$$

8. What are all values of θ , $0 \leq \theta \leq 2\pi$, for which $\cos^2\theta - \cos\theta < 0$?

$$(\cos\theta)(\cos\theta - 1) < 0$$

$$\cos\theta = 0 \quad \theta = \frac{\pi}{2}, \frac{3\pi}{2}$$

$$\cos\theta - 1 = 0 \quad \cos\theta = 1 \quad \theta = 0, 2\pi$$

$$\begin{array}{c} (\cos\theta)(\cos\theta - 1) \\ \begin{array}{ccccccc} (+) & (-) & (-)(-) & (+)(-) & (+)(-) & (+)(-) \\ \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} \\ \hline 0 & \frac{\pi}{2} & \frac{3\pi}{2} & 2\pi \end{array} \end{array}$$

$$0 < \theta < \frac{\pi}{2} \text{ or } \frac{3\pi}{2} < \theta < 2\pi$$

9. What are all values of θ , $0 \leq \theta \leq 2\pi$, for which $2\sin^2\theta - \sin\theta > 0$?

$$(\sin\theta)(2\sin\theta - 1) > 0$$

$$\sin\theta = 0 \quad \theta = 0, \pi, 2\pi$$

$$2\sin\theta - 1 = 0 \quad \sin\theta = \frac{1}{2} \quad \theta = \frac{\pi}{6}, \frac{5\pi}{6}$$

$$\begin{array}{c} (\sin\theta)(2\sin\theta - 1) \\ \begin{array}{ccccccc} (+) & (-) & (+)(+) & (+)(-) & (-)(-) & (-)(-) \\ \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} & \begin{array}{c} 0 \\ + \\ 0 \end{array} \\ \hline 0 & \frac{\pi}{6} & \frac{5\pi}{6} & \pi & 2\pi \end{array} \end{array}$$

$$\frac{\pi}{6} < \theta < \frac{5\pi}{6} \text{ or } \pi < \theta < 2\pi$$