

SINE GRAPH

Sketch the graph of $y = 2\sin(x) - 1$ by hand. Identify the amplitude, period, phase shift, and vertical shift of the graph.

Characteristics

- To determine amplitude: Find $|a|$
- To determine period: Determine $2\pi/b$.
- To determine phase shift:
 - Set the argument (part of the trigonometric function inside parentheses) equal to zero.
 - Solve the resulting equation.
 - If the resulting value is positive, the PS is to the right.
 - If the resulting value is negative, the PS is to the left.
- To determine vertical shift:
 - If k is positive, the VS is upward.
 - If k is negative, the VS is downward.
- Amplitude 2
- Period 2π
- Phase shift none
- Vertical shift 1 down

Characteristic Calculations

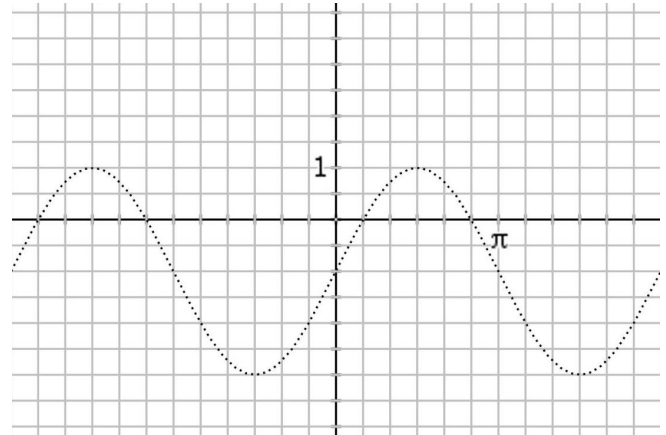
- Period: $\frac{2\pi}{1} = 2\pi$
- Phase shift: $x = 0$

Determining Key Points

old $x \angle s$	0	$\pi/6$	$\pi/2$	$5\pi/6$	π	$7\pi/6$	$3\pi/2$	$11\pi/6$
old $x \square s$	0	1	3	5	6	7	9	11
old y	0	1/2	1	1/2	0	-1/2	-1	-1/2

- To determine new x-values:
 - Set the argument equal to each old x .
 - Solve the resulting equation.
 - The resulting values tell the location of the new x .
- To determine new y-values:
 - Replace the sine term with each old y .
 - Evaluate the resulting expression.
 - The values give the new y -values.

Suggestion: Start with old $y = 0$, then proceed to either old $y = 1$ or old $y = -1$.



Key Point Calculations

- First point
 - $x = 0$
 - $y = 2(0) - 1 = 0 - 1 = -1$
- Second point
 - $x = \pi/6$ or $x = 1$ square
 - $y = 2(1/2) - 1 = 1 - 1 = 0$
- Third point
 - $x = \pi/2$ or $x = 3$ squares
 - $y = 2(1) - 1 = 2 - 1 = 1$

COSINE GRAPH

Sketch the graph of $y = \cos\left(2x - \frac{\pi}{3}\right)$ by hand. Identify the amplitude, period, phase shift, and vertical shift of the graph.

Characteristics (same as SINE graph)

- To determine amplitude: Find $|a|$
- To determine period: Determine $2\pi/b$.
- To determine phase shift:
 - Set the argument (part of the trigonometric function inside parentheses) equal to zero.
 - Solve the resulting equation.
 - If the resulting value is positive, the PS is to the right.
 - If the resulting value is negative, the PS is to the left.
- To determine vertical shift:
 - If k is positive, the VS is upward.
 - If k is negative, the VS is downward.
- Amplitude 1
- Period π
- Phase shift $\pi/6$ right
- Vertical shift none

Characteristic Calculations

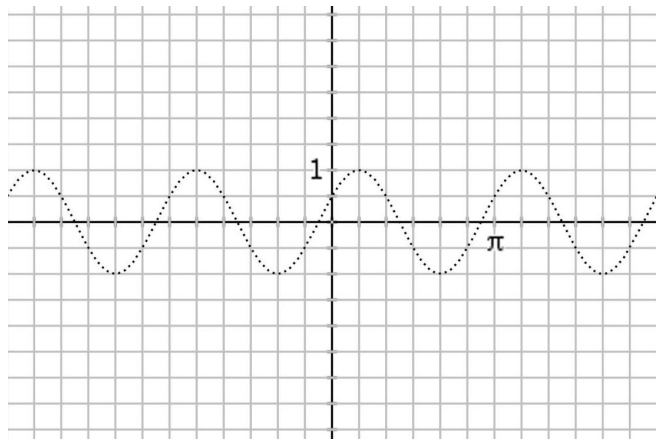
- Period: $\frac{2\pi}{2} = \pi$
- Phase shift: $2x - \frac{\pi}{3} = 0 \Rightarrow 2x = \frac{\pi}{3} \Rightarrow x = \frac{\pi}{6}$

Determining Key Points

old x \angle s	0	$\pi/3$	$\pi/2$	$2\pi/3$	π	$4\pi/3$	$3\pi/2$	$5\pi/3$
old x \square s	0	2	3	4	6	8	9	10
old y	1	1/2	0	-1/2	-1	-1/2	0	1/2

- To determine new x -values:
 - Set the argument equal to each old x .
 - Solve the resulting equation.
 - The resulting values tell the location of the new x .
- To determine new y -values:
 - Replace the cosine term with each old y .
 - Evaluate the resulting expression.
 - The values give the new y -values.

Suggestion: Start with old $y = 0$, then proceed to either old $y = 1$ or old $y = -1$.



Key Point Calculations

- First point
 - $2x - \frac{\pi}{3} = \frac{\pi}{2} \Rightarrow 2x = \frac{2\pi}{6} + \frac{3\pi}{6} = \frac{5\pi}{6} \Rightarrow x = \frac{5\pi}{12}$ OR
 $2x - 2 = 3 \Rightarrow 2x = 5 \Rightarrow x = 2.5$ squares
 - $y = 0$
- Second point
 - $2x - \frac{\pi}{3} = \frac{2\pi}{3} \Rightarrow 2x = \pi \Rightarrow x = \frac{\pi}{2}$ OR
 $2x - 2 = 4 \Rightarrow 2x = 6 \Rightarrow x = 3$ squares
 - $y = -1/2$
- Third point
 - $2x - \frac{\pi}{3} = \pi \Rightarrow 2x = \frac{\pi}{3} + \frac{3\pi}{3} = \frac{4\pi}{3} \Rightarrow x = \frac{2\pi}{3}$ OR
 $2x - 2 = 6 \Rightarrow 2x = 8 \Rightarrow x = 4$ squares
 - $y = -1$