

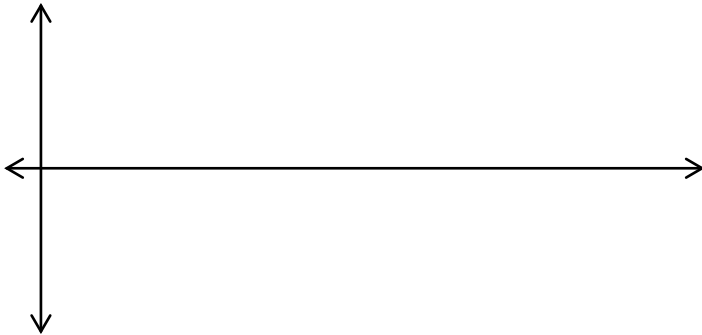
Graphs of Sine, Cosine, and Tangent
With Shifts
Module 3, Unit 7, Lesson 8

Sine function $y = A\sin(Bx - C) + D$

1. **amplitude** $|A|$ – the vertical distance of each wave
2. **period** $\frac{2\pi}{B}$ – how long it take to complete one cycle
3. **Interval** = period $\times \frac{1}{4}$
4. **phase shift** $\frac{C}{B}$ – shift left or right (New starting point)
5. **vertical shift** D – shift up or down (New intercept)

Graph one period of the function.

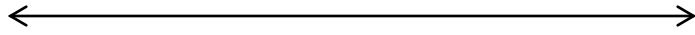
a. $y = \sin\left(x - \frac{\pi}{2}\right)$



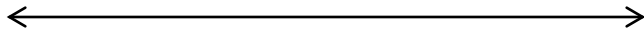
b. $y = 2\sin x - 1$



c. $y = 3 \sin\left(2x + \frac{\pi}{2}\right)$



d. $y = -2 \sin(2x - \pi) + 1$



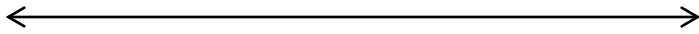
Cosine Function $y = A \cos(Bx - C) + D$

1. **amplitude** $|A|$ – the vertical distance of each wave
2. **period** $\frac{2\pi}{B}$ – how long it take to complete one cycle
3. **Interval** = period $\times \frac{1}{4}$
4. **phase shift** $\frac{C}{B}$ – shift left or right (New starting point)
5. **vertical shift** D – shift up or down (New intercept)

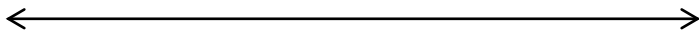
a. $y = 4\cos(2x + \pi)$



b. $y = -\cos\frac{\pi}{2}x + 2$



c. $f(x) = 2\cos\left(\pi x - \frac{\pi}{2}\right) - 1$

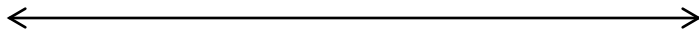


Tangent Functions $y = A \tan(Bx - C) + D$

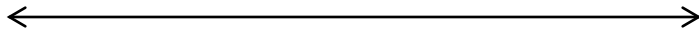
1. **Period** $\frac{\pi}{B}$
2. **Interval** = period $\times \frac{1}{4}$
3. **Asymptotes (Phase Shift)** $Bx - C = -\frac{\pi}{2}$ and $Bx - C = \frac{\pi}{2}$ (New asymptotes)
4. **vertical shift** D – shift up or down (New intercept)

5. Identify an x-intercept, midway between the consecutive asymptotes.
6. Find the points on the graph $\frac{1}{4}$ and $\frac{3}{4}$ of the way between consecutive asymptotes. These points have y-coordinates $-A$ and A , respectively.

a. $y = \tan\left(x + \frac{\pi}{4}\right)$



b. $y = -2\tan\left(\frac{1}{2}x - \frac{\pi}{2}\right) + 1$



c. $f(x) = -\frac{1}{2}\tan\frac{\pi}{2}x + 1$

