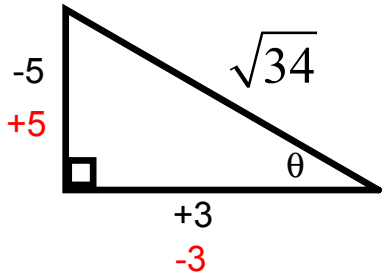
$\tan\theta = \frac{-5}{3}$ What is secant? What is secant²?



$$\frac{1}{\cos\theta} = \sec\theta$$

$$\frac{1}{\pm 3/\sqrt{34}} = \sec\theta$$

$$\pm\frac{\sqrt{34}}{3} = \sec\theta$$

$1+\tan^2\theta = \sec^2\theta$

$$1+\left(\frac{-5}{3}\right)^2 = \sec^2\theta$$

$$1+\frac{25}{9} = \sec^2\theta$$

$$\frac{34}{9} = \sec^2\theta$$

$$\pm\sqrt{\frac{34}{9}} = \sec\theta$$

$$\pm\frac{\sqrt{34}}{3} = \sec\theta$$

Overview of 5.4 challenges:

- Move from unit circle thinking to thinking about the function
  (and still remember unit circle)
- Apply your transformation logic to the sine function.
- Pick up the details and new vocab.
- Go forwards and backwards (make graph from equation, equation from graph)
- Practice so you can work with the graphs fast.
  WATCH THE X-AXIS

Properties of the Cosine Function

1. The domain is the set of all real numbers.
2. The range consists of all real numbers from -1 to 1, inclusive.
3. The cosine function is an even function, as the symmetry of the graph with respect to the y-axis indicates.
4. The cosine function is periodic, with period 2π.
5. The x-intercepts are $\ldots, -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \ldots$; the y-intercept is 1.
6. The maximum value is 1 and occurs at $x = \ldots, -2\pi, 0, 2\pi, 4\pi, 6\pi, \ldots$; the minimum value is -1 and occurs at $x = \ldots, -\pi, \pi, 3\pi, 5\pi, \ldots$.

Properties of the Sine Function

1. The domain is the set of all real numbers.
2. The range consists of all real numbers from -1 to 1, inclusive.
3. The sine function is an odd function, as the symmetry of the graph with respect to the origin indicates.
4. The sine function is periodic, with period 2π.
5. The x-intercepts are $\ldots, -2\pi, -\pi, 0, \pi, 2\pi, 3\pi, \ldots$; the y-intercept is 0.
6. The maximum value is 1 and occurs at $x = \ldots, -\frac{3\pi}{2}, \frac{\pi}{2}, \frac{5\pi}{2}, \frac{9\pi}{2}, \ldots$; the minimum value is -1 and occurs at $x = \ldots, -\frac{\pi}{2}, \frac{3\pi}{2}, \frac{7\pi}{2}, \frac{11\pi}{2}, \ldots$.

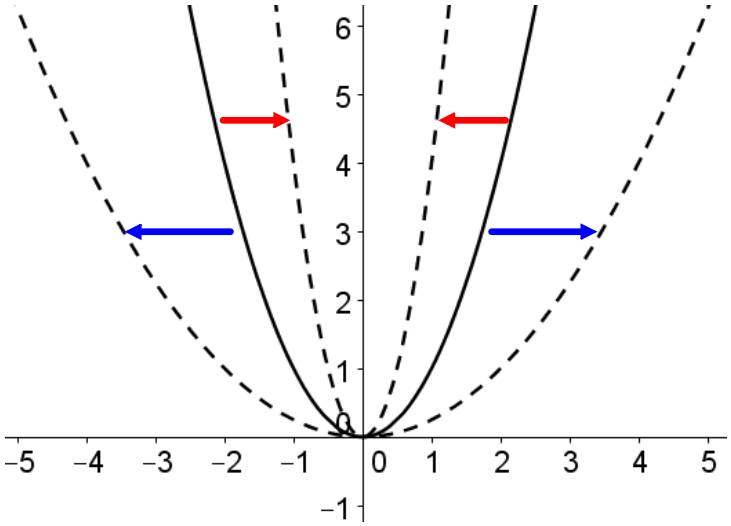
Sinusoidal function

$$y = A f\left(\omega x + \phi\right) + B$$

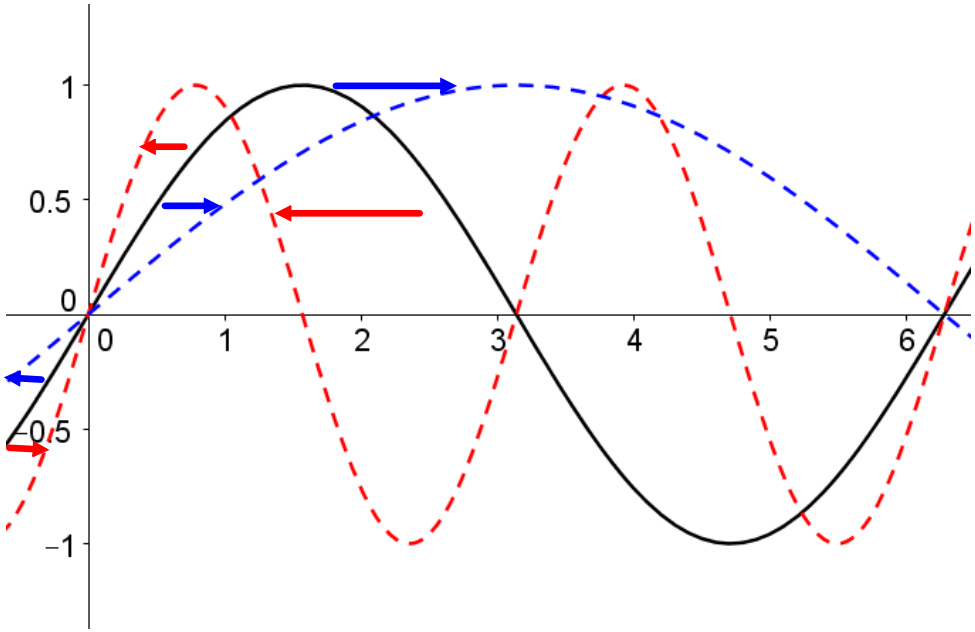
$$y = A\sin(\omega x + \phi) + B$$

Period - The distance along the x-axis from the beginning of the cycle to the end.
Amplitude - The distance along the y-axis from minimum to maximum, divided by 2.
Midline - The horizontal line midway between the minimum and maximum
Phase shift - The left right shift, but not what you would expect

Transformations: Horizontal stretch-compression

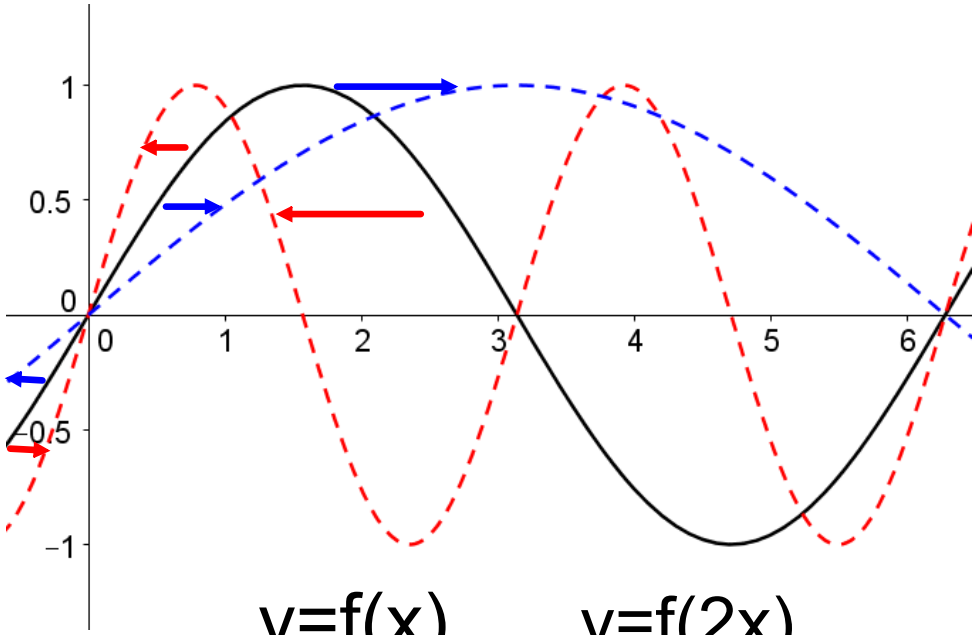


y=f(x) y=f(2x)



y=f(.5x)

Transformations: Horizontal stretch-compression



y=f(x) y=f(2x)

y=f(.5x)

Sine repeats itself after every 2π - has a period of 2π

When you stretch or compress horizontally it repeats faster or slower.

Period:
lengthens from π to 4π (slower) or
shortens from π to to $\pi/2$ (faster)

Tricky part 1) $y = A\sin(\omega x + \phi) + B$ ω

The period is inversely related to ω

If $\omega > 0$, the amplitude and period of $y = A\sin(\omega x)$ and $y = A\cos(\omega x)$ are given by

$$\text{Amplitude} = |A| \qquad \text{Period} = T = \frac{2\pi}{\omega} \qquad (1)$$

Tricky part 2)

You can't read the phase shift from the equation unless you factor

$$y = A\sin(\omega\left(x + \frac{\phi}{\omega}\right)) + B$$