https://www.desmos.com/calculator/cz6oiqjfzv?mobile=true

From 1.7:

y = |x| + k Moves the graph UP k units from (0,0)
y = |x| - k Moves the graph down k units from (0,0)

y = |x + k| Moves the graph Left k units from (0,0)
y = |x - k| Moves the graph Right k units from (0,0)

yesterday! a sin(bx)

Book uses:

y = a*sin (bx - c) + d or

y = a*sin b(x - c/b) + d

Summary **Families of Sine and Cosine Functions**

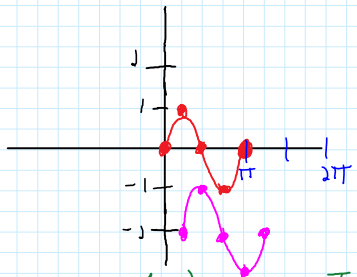
Parent Function	Transformed Function
$y = \sin x$	$y = a \sin b(x - h) + k$
$y = \cos x$	$y = a \cos b(x - h) + k$

- $|a|$ = amplitude (vertical stretch or shrink)
- $\frac{2\pi}{b}$ = period (when x is in radians and $b > 0$)
- h = phase shift, or horizontal shift
- k = vertical shift

y = sin 2(x - π/4) - 2

Step 1: Graph y = sin 2x

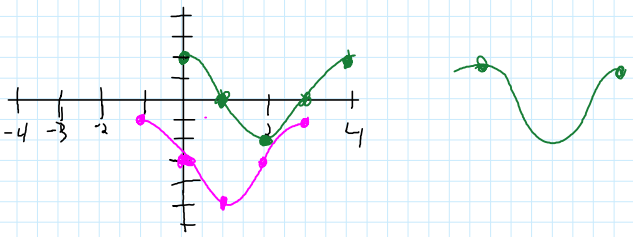
$T = \frac{2\pi}{b} = \frac{2\pi}{2} = \pi$



Step 2: Translate graph of step one down 2 and Right $\frac{\pi}{4}$

#2: Sketch $y = 2\cos\frac{\pi}{2}(x+1) - 3$

$y = 2\cos\frac{\pi}{2}x$ $T = \frac{2\pi}{\frac{\pi}{2}} = 2\pi \cdot \frac{2}{\pi} = 4$



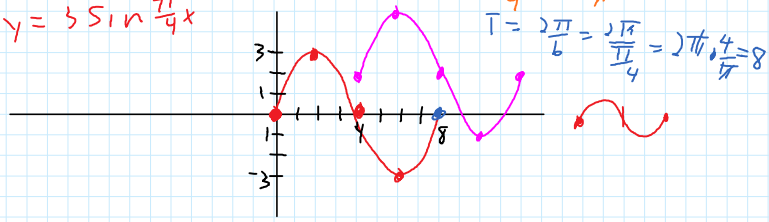
$y = 3 \sin\left(\frac{\pi}{4}x - \pi\right) + 2$

$y = 3 \sin \frac{\pi}{4}(x - 4) + 2$

$y = 3 \sin \frac{\pi}{4}x$

$\frac{\pi}{\frac{\pi}{4}} = \pi, \frac{4}{\pi} = 4$

$T = \frac{2\pi}{\frac{\pi}{4}} = 2\pi, \frac{4}{\pi} = 8$

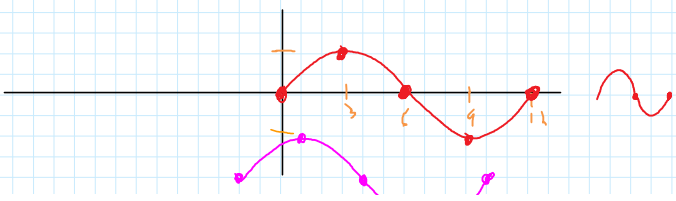


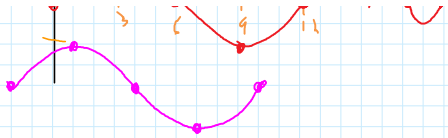
$y = 2 \sin\left(\frac{\pi}{6}x + \frac{\pi}{3}\right) - 4$

$y = 2 \sin \frac{\pi}{6}(x + 2) - 4$

$y = 2 \sin \frac{\pi}{6}x$

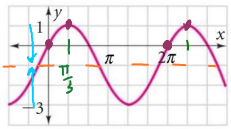
$T = \frac{2\pi}{\frac{\pi}{6}} = 2\pi, \frac{6}{\pi} = 12$





Extra examples:
Write a sine or cosine function for the following:

* Cos

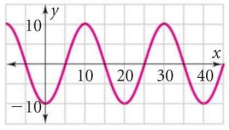


$T = \frac{2\pi}{b} = 2\pi$

$b = 1$

$y = 2\cos\left(1\cdot\left(x-\frac{\pi}{3}\right)\right)+(-1)$

* Sin



$T = \frac{2\pi}{b} = 20$

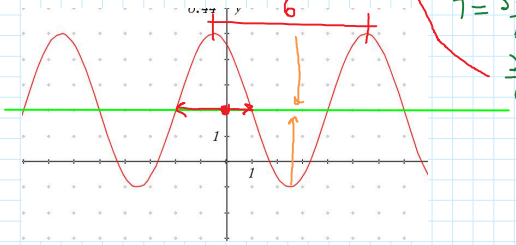
$\frac{2\pi}{20} = b$

$y = 10\sin\left(\frac{\pi}{10}(x-5)\right)+0$

$-10\sin\frac{\pi}{10}(x+5)+0$

$-10\cos\frac{\pi}{10}(x+0)+0$

$y = 3\cos\frac{\pi}{3}\left(x+\frac{1}{2}\right)+2$



$T = \frac{2\pi}{b} = 6$

$\frac{2\pi}{6} = b$

y= 3 Sin $\frac{\pi}{3}$ (x + 2) + 2

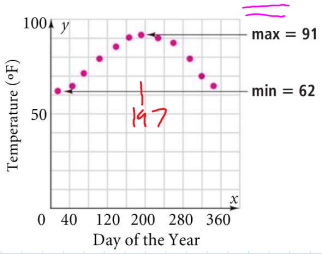
$y = -3\sin\frac{\pi}{3}(x-1)+2$

#3:

Day of Year	Temperature (°F)
16	62
47	65
75	71
106	79
136	85
167	89
197	91
228	90
259	87
289	79
320	70
350	64

Temperature Cycles The table at the left gives the typical high temperature in New Orleans, Louisiana, on several days of the year (January 1 = 1, February 1 = 32, and so on). Plot the data in the table. Write a cosine model for the data.

Plot the data.



$\frac{91+62}{2} = 76.5$

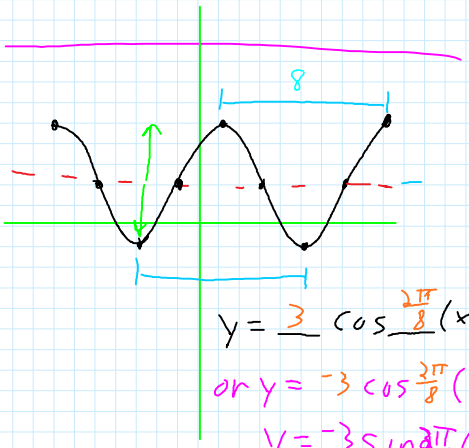
$91 - 76.5 = 14.5$

$62 + 14.5$

$T = \frac{2\pi}{b} = 365$

$\frac{2\pi}{365} = b$

$y = 14.5\cos\frac{2\pi}{365}(x-197)+76.5$



$T = \frac{2\pi}{b} = 8$

$\frac{2\pi}{8} = b$

$y = \underline{3}\cos\frac{2\pi}{8}(x - \underline{9}) + \underline{2}$

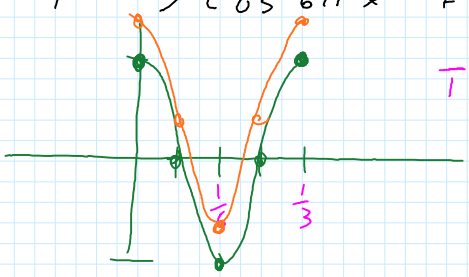
or $y = -3\cos\frac{2\pi}{8}(x-5) + 2$

$y = -3\sin\frac{2\pi}{8}(x-3) + 2$

4.5 day II Page 304: 41-51 odd, 59-63 odd, 69, 71

47. $y = 2 + 5\cos 6\pi x$

$y = 5\cos 6\pi x + 2$

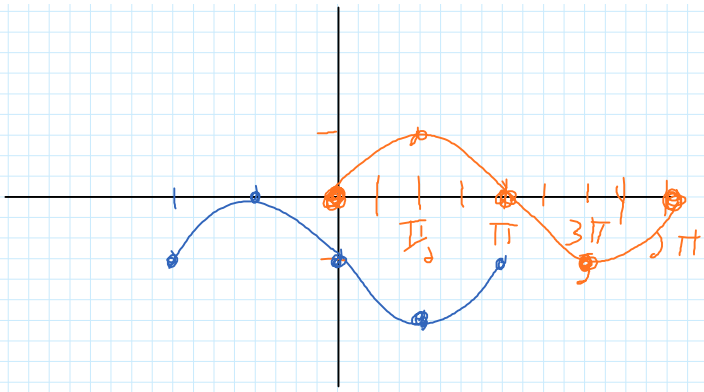


$T = \frac{2\pi}{b} = \frac{2\pi}{6\pi} = \frac{1}{3}$

49)

49. $y = 3\sin(x + \pi) - 3$

$3\sin x$



$5 \sin x$

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

$1 \cos 2\pi\left(x - \frac{1}{4}\right) + 1$

$\frac{\frac{\pi}{2}}{2\pi} = \frac{\pi}{2} \cdot \frac{1}{2\pi} = \frac{1}{4}$

$T = \frac{2\pi}{b} = \frac{2\pi}{2\pi} = 1$