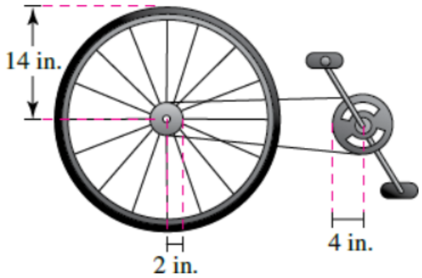
The radii of the pedal sprocket, the wheel sprocket, and the wheel of the bicycle in the figure are 4 inches, 2 inches, and 14 inches, respectively. A cyclist pedals at a rate of 1 revolution per second.



(a) Find the speed of the bicycle in feet per second and miles per hour.

[ ] ✖ $\frac{14\pi}{3}$ feet per second

[ ] ✖ $\frac{35\pi}{11}$ mph

(b) Use your result from part (a) to write a function for the distance *d* (in miles) a cyclist travels in terms of the number *n* of revolutions of the pedal sprocket.

d = [ ] ✖ $\frac{7\pi n}{7920}$ mi

(c) Write a function for the distance *d* (in miles) a cyclist travels in terms of the time *t* (in seconds).

d = [ ] ✖ $\frac{7\pi t}{7920}$ mi

Compare this function with the function from part (b).

The function from (b) is ---Select--- ✖ linear .

The function from (c) is ---Select--- ✖ linear .

Radius front sprocket : 4 in
" rear " : 2 in
" wheel : 14 in

$$\left(\frac{1 \text{ rev front}}{s}\right)\left(\frac{\cancel{4}^{2} \text{ revs rear}}{\cancel{2}_{1} \text{ revs front}}\right)\left(\frac{\cancel{2}^{1}\pi \text{ radians}}{1 \text{ rev rear}}\right)\left(\frac{14 \text{ inch}}{\text{radius rear wheel}}\right)\left(\frac{1 \text{ ft}}{\cancel{12}_{6} \text{ in}}\right)$$

$$\frac{(2\pi)(14)}{6}\frac{\text{ft}}{\text{s}} = \boxed{\frac{14\pi}{3}\text{ ft/s}} \quad (a)$$

$$\theta = \frac{s}{r}$$
$$s = r\theta$$

$$\left(\frac{\cancel{14}^{7}\pi}{\cancel{3}}\frac{\text{ft}}{\text{s}}\right)\left(\frac{\cancel{60}^{\cancel{20}\,5}\text{ mi/hr}}{\cancel{88}_{\cancel{22}\,11}\text{ ft/s}}\right) = \boxed{\frac{35\pi}{11}\frac{\text{mi}}{\text{hr}}}$$

(b) $$\left(n \text{ revs } \cancel{\text{front}}\right)\left(\frac{2 \text{ revs } \cancel{\text{rear}}}{1 \text{ rev } \cancel{\text{front}}}\right)\left(\frac{2\pi \text{ radians}}{\text{rev } \cancel{\text{rear}}}\right)\left(\frac{14 \text{ } \cancel{\text{inch}}}{\text{radius rear wheel}}\right)\left(\frac{1 \text{ } \cancel{\text{ft}}}{\cancel{12}\text{ in}}\right)\left(\frac{1 \text{ mi}}{5280 \text{ } \cancel{\text{ft}}}\right)$$

$$= \frac{\cancel{(2)}\cancel{(2)}(\cancel{14})^{7}\pi n}{\cancel{12}_{3}(\cancel{5280})_{2640}} = \frac{7\pi}{3(2640)}n = \frac{7\pi}{7920}n \text{ miles}$$

$n = 1$ rev/s

(c) $$\frac{\left(\frac{7\pi}{7920}(1)\text{mi}\right)}{s}\, t$$

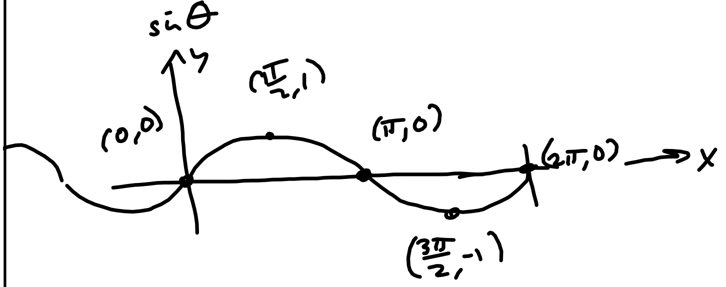
$$\begin{array}{r} 264 \\ \times\ 30 \\ \hline 7920 \end{array}$$

Cofunction Identity : co-funcs of complementary angles are equal

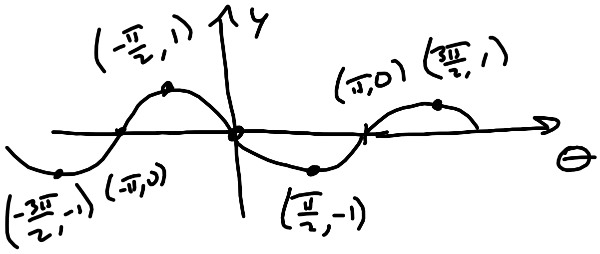
$\sin(\frac{\pi}{2}-\theta)=\cos\theta$ $\tan(\frac{\pi}{2}-\theta)=\cot\theta$

$\cos(\frac{\pi}{2}-\theta)=\sin\theta$ etc.

$\sin(\frac{\pi}{2}-\theta) = \sin(-(\theta-\frac{\pi}{2}))$

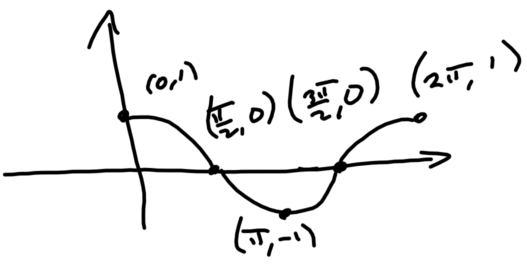


$\sin(-\theta) = (-\sin\theta$ (sine is odd func))



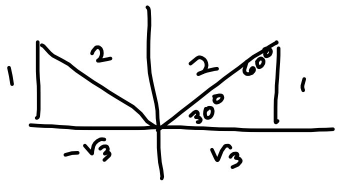
$\sin(-(\theta-\frac{\pi}{2})) = \sin(\frac{\pi}{2}-\theta) = \cos\theta$

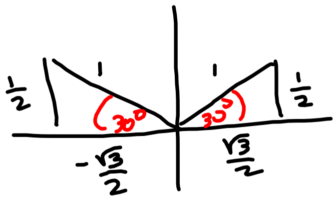
$\theta \longmapsto \theta+\frac{\pi}{2}$



Find 2 solutions in $(0^\circ, 360^\circ)$ and $(0, 2\pi)$

$$\sin\theta = \frac{1}{2} = \frac{opp}{hyp} = \frac{y}{r} = \frac{y}{\sqrt{x^2+y^2}}$$

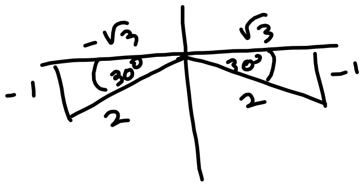




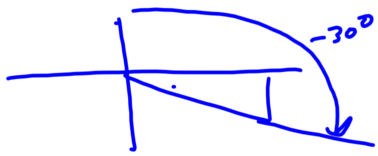
$\theta = 30^\circ, 150^\circ$

$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$

$\sin\theta = -\frac{1}{2}$



$$\left.\begin{aligned} \arcsin\left(-\tfrac{1}{2}\right) &= -30^\circ \\ \arcsin\left(-\tfrac{1}{2}\right) &= -\tfrac{\pi}{6} \end{aligned}\right\} \text{CALCULATOR}$$



$180^\circ - \arcsin\left(-\frac{1}{2}\right)$

$= 180^\circ + 30^\circ = 210^\circ$

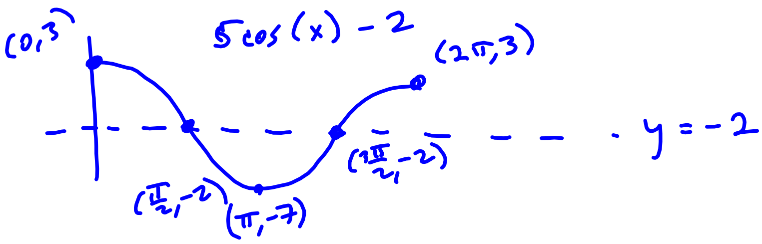
$360^\circ + \arcsin\left(-\frac{1}{2}\right)$

$= 360^\circ - 30^\circ = 330^\circ$

$$y = 5\cos\left(\pi x + \frac{\pi}{2}\right) - 2$$

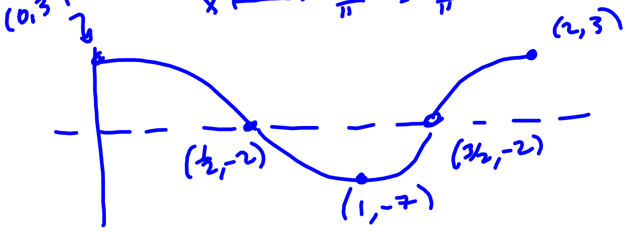
$$= 5\cos\left(\pi\left(x + \frac{1}{2}\right)\right) - 2$$

$5\cos(x) - 2$



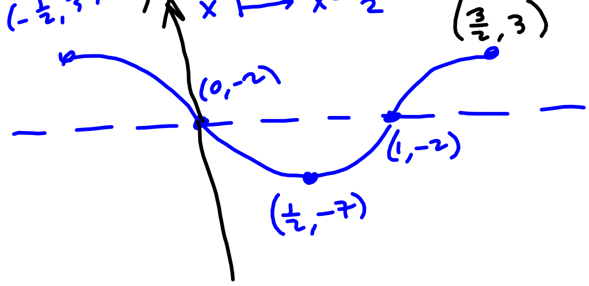
$5\cos(\pi x) - 2$

$x \longmapsto \frac{x}{\pi} = \frac{1}{\pi}x$



$5\cos\left(\pi\left(x + \frac{1}{2}\right)\right)$

$x \longmapsto x - \frac{1}{2}$

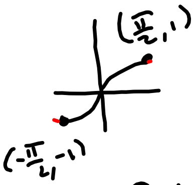


Fill in the blanks. (Enter the domain in interval notation.)

Function	Alternative Notation	Domain	Range
$y = \arcsin x$	$y =$ ✗ $\sin^{-1} x$	✗ $[-1, 1]$	$-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

Restricted

sine



$D = [-\frac{\pi}{2}, \frac{\pi}{2}]$

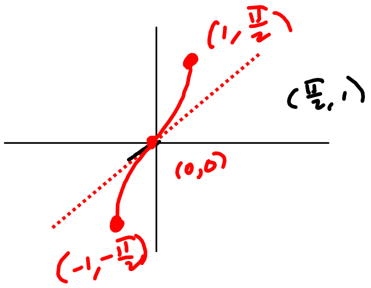
$R = [-1, 1]$

arc sine:

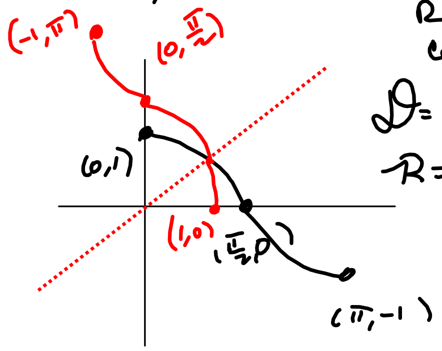
$D = [-1, 1]$

$R = [-\frac{\pi}{2}, \frac{\pi}{2}]$

Build $\sin^{-1}(x) = \arcsin(x)$ off sine graph



cosine, restricted



Restricted cosine

$\mathcal{D} = [0, \pi]$

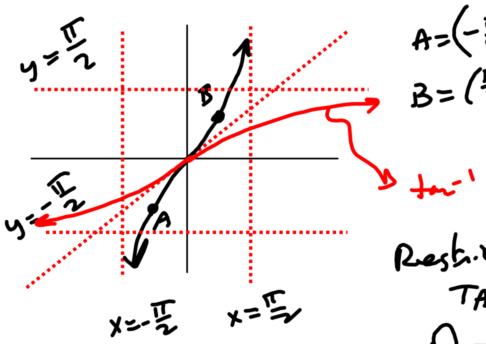
$\mathcal{R} = [-1, 1]$

$\cos^{-1}(x) = \arccos(x)$

$\mathcal{D} = [-1, 1]$

$\mathcal{R} = [0, \pi]$

Restricted Tangent



$A = (-\frac{\pi}{4}, -1)$

$B = (\frac{\pi}{4}, 1)$

Restricted TAN

$\mathcal{D} = (-\frac{\pi}{2}, \frac{\pi}{2})$

$\mathcal{R} = (-\infty, \infty)$

TAN^{-1}

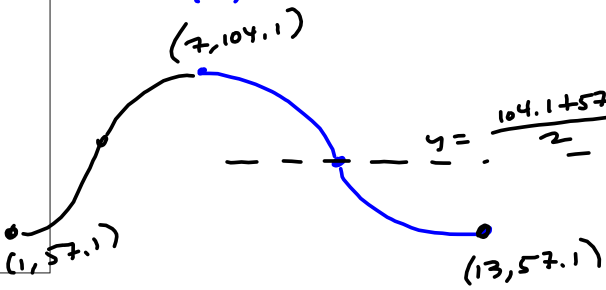
$\mathcal{D} = (-\infty, \infty)$

$\mathcal{R} = (-\frac{\pi}{2}, \frac{\pi}{2})$

The table shows the maximum daily high temperatures (in degrees Fahrenheit) in Las Vegas L and International Falls I for month t, where $t = 1$ corresponding to January.†

Month, t	Las Vegas, L	International Falls, I
1	57.1	13.8
2	63.0	22.4
3	69.5	34.9
4	78.1	51.5
5	87.8	66.6
6	98.9	74.2
7	104.1	78.6
8	101.8	76.3
9	93.8	64.7
10	80.8	51.7
11	66.0	32.5
12	57.3	18.1

(1, 57.1)
(7, 104.1)



$y = \frac{104.1+57.1}{2} = 80.6$

Amp: $\frac{104.1-57.1}{2}$

$y = a\cos(b(x-7)) + 80.60$

$y = 23.5\cos(b(x-7)) + 80.60$

Period is $T = 12$ mos

$bx = 2\pi$ when $x = 12$

$12b = 2\pi$

$b = \frac{2\pi}{12} = \frac{\pi}{6}$

$23.50\cos\left(\frac{\pi}{6}(t-7)\right) + 80.60$

```
(104.1+57.1)/2
                80.6
(104.1-57.1)/2
                23.5
```

970-290-0550

(a) A model for the temperature in Las Vegas is

$L(t) = 80.60 + 23.50\cos\left(\frac{\pi t}{6} - 3.67\right).$

Find a trigonometric model for the temperatures in International Falls. (Round all numerical values to one decimal place.)

$I(t) =$ [ ] $32.4\cos\left(3.7 - \frac{\pi t}{6}\right) + 46.2$

$$a^b a^c = a^{b+c}$$

$$\log_{10}(a^b a^c) = b\log_{10}a + c\log_{10}a$$