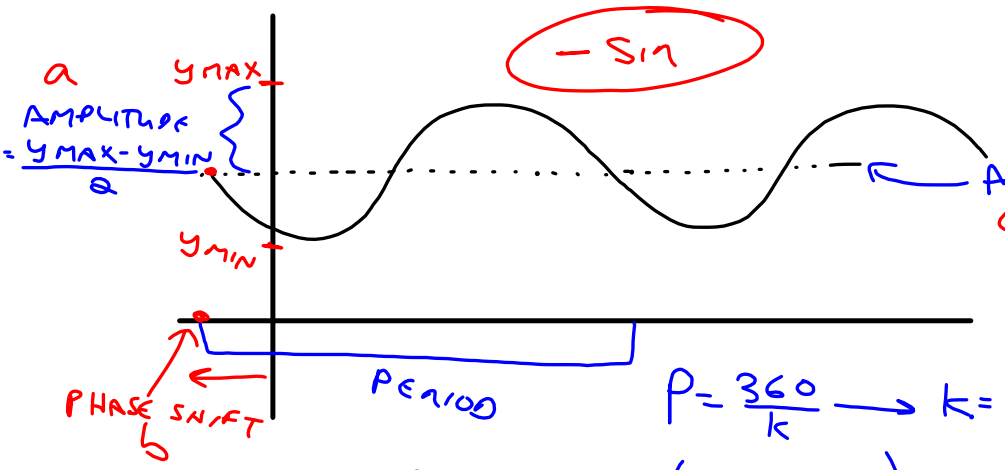
6.6 Investigating Models of Sinusoidal Functions

May 15

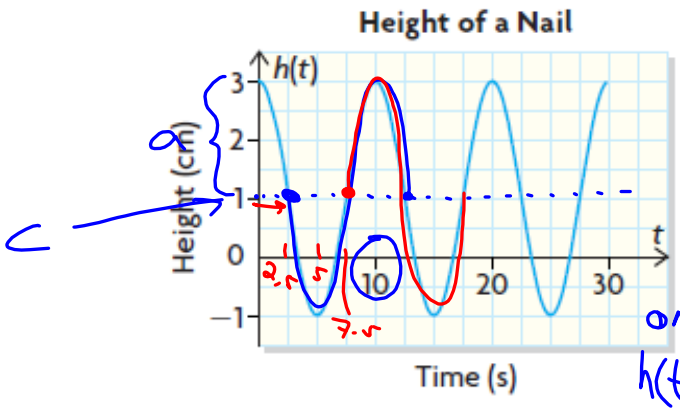
sin or cos



$P = \frac{360}{k} \rightarrow k = \frac{360}{P}$

$f(x) = -a \sin\left(\frac{360}{P}(x-b)\right) + c$

A nail located on the circumference of a water wheel is moving as the current pushes on the wheel. The height of the nail in terms of time can be modelled by the graph shown.



$P = \frac{360}{k}$

$k = \frac{360}{P} = \frac{360}{10} = 36$

$h(t) = 2\cos(36t)^\circ + 1$

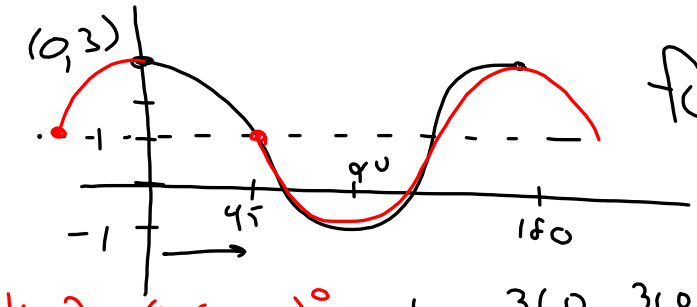
OR

$h(t) = -2\sin(36(t-2.5))^\circ + 1$

OR

$h(t) = 2\sin(36(t-7.5))^\circ + 1$

A sinusoidal function has an amplitude of 2 units, a period of 180°, and a maximum at (0, 3). Represent the function with an equation in two different ways.



$f(x) = 2\cos(2x)^\circ + 1$

or

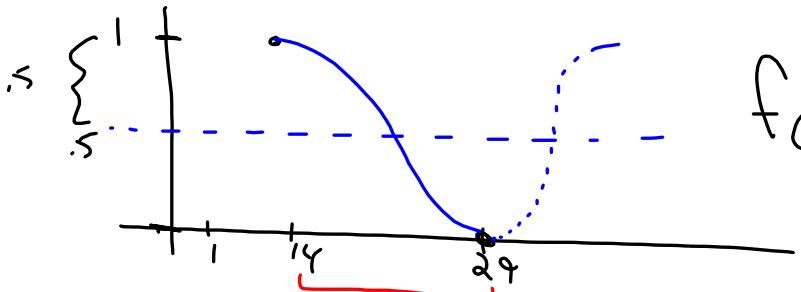
$f(x) = -2\sin(2(x-45))^\circ + 1$

$y = 2\sin(2(x+45))^\circ + 1 \quad k = \frac{360}{p} = \frac{360}{180} = 2$

The Moon is always half illuminated by the Sun. How much of the Moon we see depends on where it is in its orbit around Earth. The table shows the proportion of the Moon that was visible from Southern Ontario on days 1 to 74 in the year 2006.

Day of Year	1	4	7	10	14	20	24	29	34
Proportion of Moon Visible	0.02	0.22	0.55	0.83	1.00	0.73	0.34	0.00	0.28

Day of Year	41	44	48	53	56	59	63	70	74
Proportion of Moon Visible	0.92	1.00	0.86	0.41	0.12	0.00	0.23	0.88	1.00



$f(x) = 0.5\cos(12(x-14))^\circ + 0.5$

$\frac{1}{2}p = 15$

$p = 30$

$k = \frac{360}{p} = \frac{360}{30} = 12$

p. 391#1-7,11,13