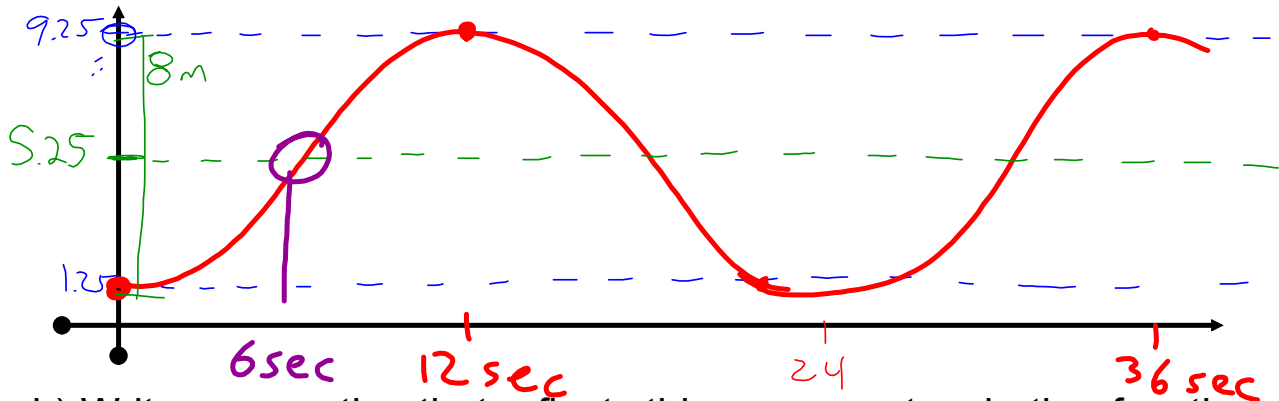


A Ferris wheel of diameter 8 metres arrives at the local fair. A ramp is built in order to get onto the ride. The ramp is 1.25 metres tall, graph the ride that a single rider takes if one rotation is approximately 24 seconds.

a) Graph at least one rotation of the Ferris wheel w.r.t height v. time.



b) Write an equation that reflects this movement as both a function of sine and cosine.

$$\text{mid line} = 5.25$$

$$\text{Amp} = 4 \text{ m}$$

$$\begin{aligned} \text{Period} &= \frac{2\pi}{K} \\ &= 24 \text{ sec} \end{aligned}$$

$$\begin{aligned} 24 &= \frac{2\pi}{K} \\ K &= \frac{2\pi}{24} \\ &= \frac{\pi}{12} \end{aligned}$$

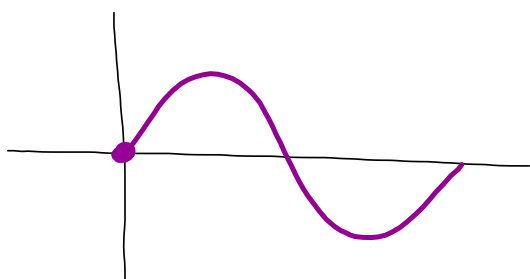
Sine (6 units right)

$$4 \sin\left(\frac{\pi}{12}(t-6)\right) + 5.25$$

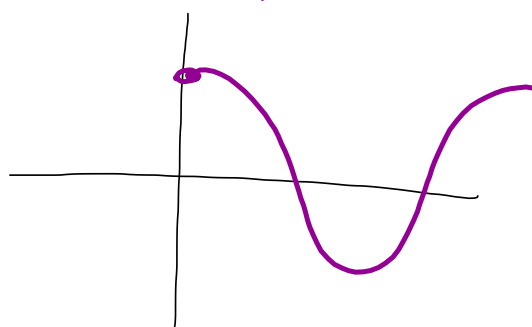
Cosine

$$4 \cos\left(\frac{\pi}{12}(t-12)\right) + 5.25$$

$\sin x$

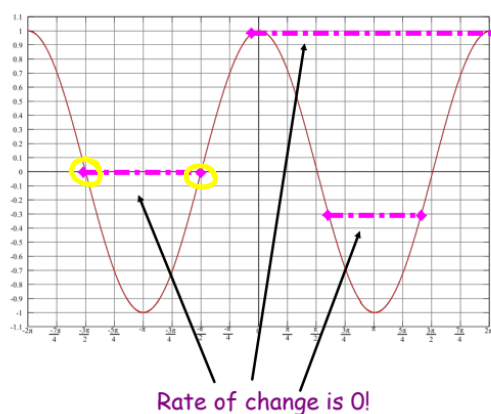


$\cos x$

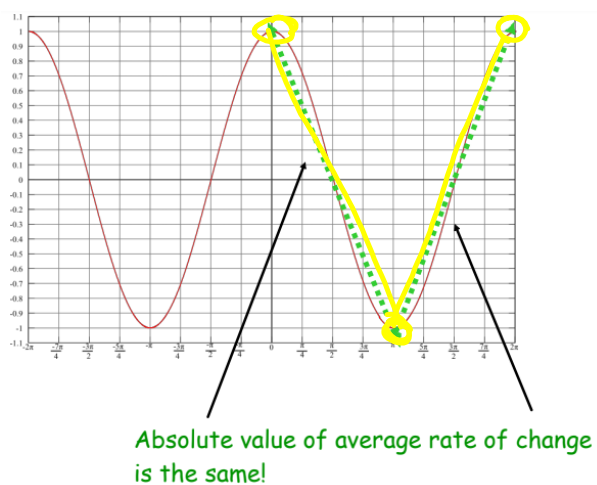


Trig Functions and Rates of Change

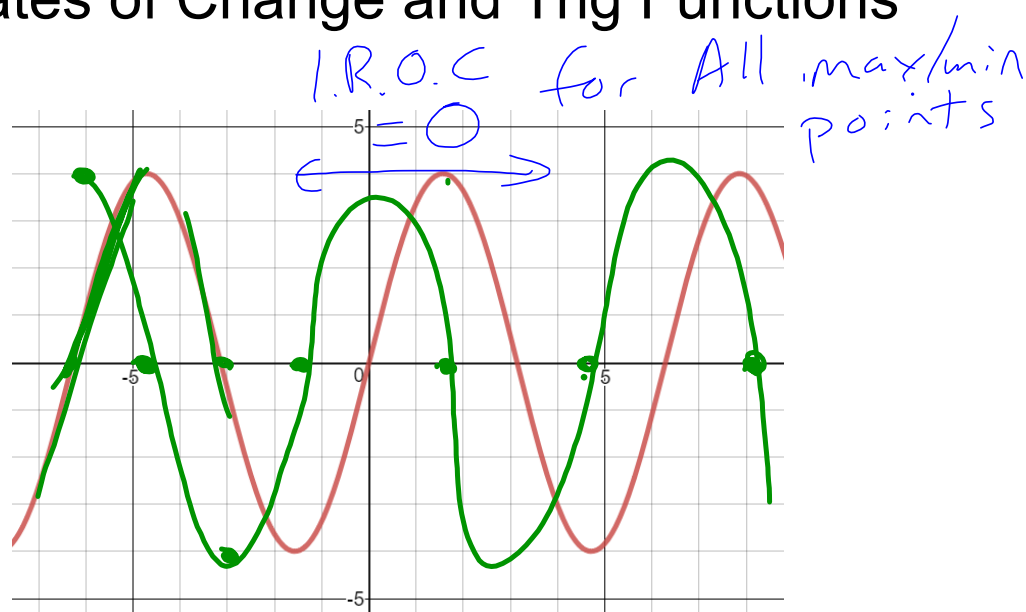
The average rate of change is zero on any interval where the values of the function are the same



The absolute values of the A.R.O.C. on the intervals between the max and the min and the min and the max are the same

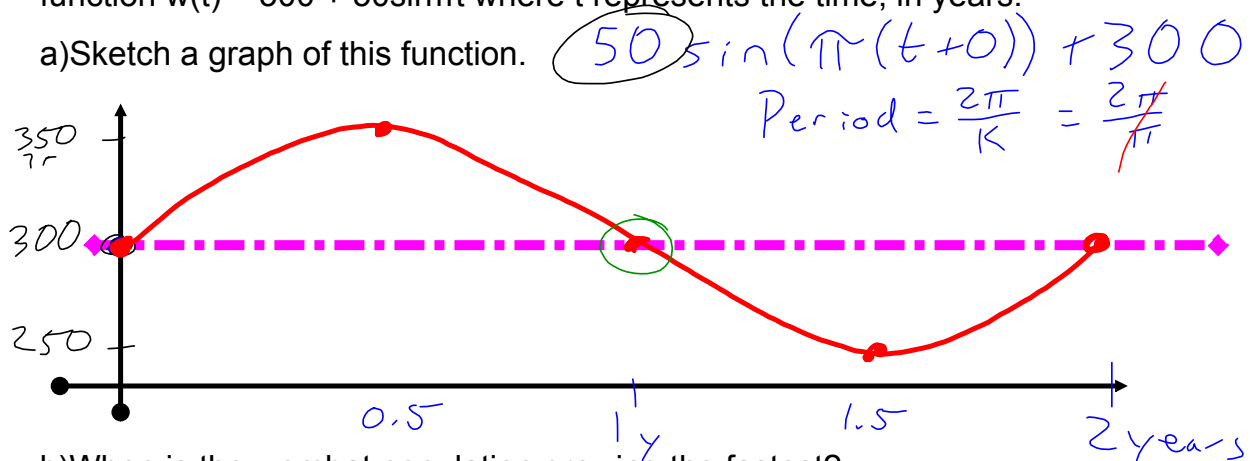


Characteristics of Instantaneous Rates of Change and Trig Functions



The population of wombats, w , in a certain area can be modelled by the function $w(t) = 300 + 50\sin\pi t$ where t represents the time, in years.

a) Sketch a graph of this function.



b) When is the wombat population growing the fastest?

Every even year (ex, 0, 2, 4, ...)

c) When is the wombat population decreasing the fastest?

Every odd year (ex. 1, 3, 5, ...)

d) When is the instantaneous rate of change 0?

Every half year (ex 0.5, 1.5, 2.5)

e) What is the average rate of change from Year 1 to Year 5?

$$w(t) = 300 + 50\sin\pi t \quad \underline{\text{zero}}$$

$$= \frac{w(5) - w(1)}{5 - 1}$$

$$= \frac{300 - 300}{4}$$

$$= 0$$

The following table shows the average daily temperature for North Bay, Ontario.

Month	Temperature(C)
Jan	-14.0
Feb	-12.0
Mar	-4.9
Apr	3.2
May	11.0
June	19.1
July	22.4
Aug	20.6
Sept	15.9
Oct	8.3
Nov	-1.7
Dec	-10.0

- a) Write a sine function to model the data.
 b) Make a scatter plot of the data and graph your model on the same plot.

$$\min = -14.0$$

$$\max = 22.4$$

$$\begin{aligned} \text{Amp} &= \frac{\max - \min}{2} \\ &= \frac{22.4 - (-14.0)}{2} \\ &= \frac{36.4}{2} \\ &= 18.2 \end{aligned}$$

$$\begin{aligned} \text{midline} \\ \min + \text{Amp} \\ -14.0 + 18.2 \\ = 4.2 \end{aligned}$$

$$\text{Period} = 12$$

$$\begin{aligned} k &= \frac{2\pi}{12} \\ &= \frac{\pi}{6} \end{aligned}$$

$$f(t) = 18.2 \sin\left(\frac{\pi}{6}(t - 4)\right) + 4.2$$

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