Today's Learning Goal(s):

Date: Dec. 2/19

By the end of the class, I will be able to:

a) determine how each transformation affects the sine and cosine curves.

Show Level 4 Exemplars

Last day's work: pp. 363-364 #1 – 4, 8, 9 [15,16]

3 16

pp. 370-372 #1 – 8, 13 [15]

1, 8, 2, 6

Today's Homework Practice includes:

pp. 377-378 A – U

p. 379 #1 – 3

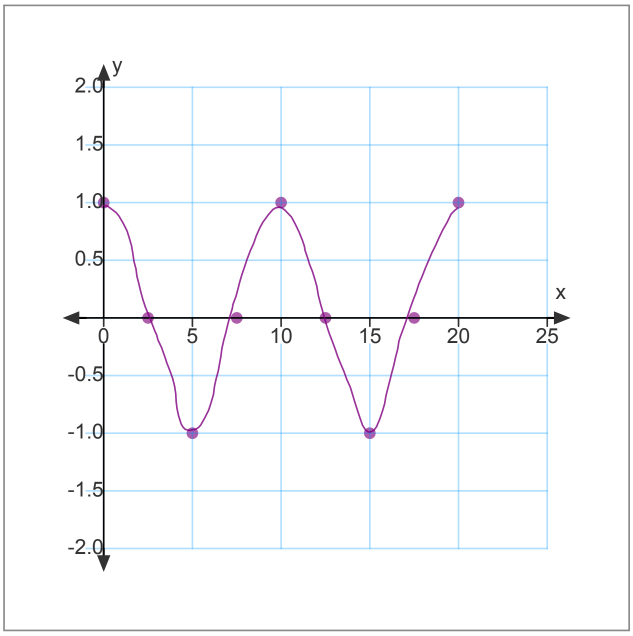
p. 363 **3.** A buoy rises and falls as it rides the waves. The equation $h(t) = \cos(36t)°$ models the displacement of the buoy, $h(t)$, in metres at t seconds.

a) Graph the displacement from 0 s to 20 s, in 2.5 s intervals.

b) Determine the period of the function from the graph. – 10 sec

c) What is the displacement at 35 s? $h(35) = \cos(36(35)) = -1$

d) At what time, to the nearest second, does the displacement first reach −0.8 m? From Graph, $t \doteq 4$ sec



t	h(t)
0	1
2.5	0
5	-1
7.5	0
10	1
12.5	0
15	-1
17.5	0
20	1

or $-0.8 = \cos(36t)$

Let $x = 36t$

$-0.8 = \cos x$

$\cos^{-1}(-0.8) = x$

$x \doteq 143.13$

But $x = 36t$

$\therefore \frac{x}{36} = t$

$t \doteq \frac{143.13}{36}$

$\doteq 3.97$

$\doteq 4$ sec.

p. 363

16. A spring bounces up and down according to the model $d(t) = 0.5\cos(120t)°$, where $d(t)$ is the displacement in centimetres from the rest position and t is time in seconds. The model does not consider the effects of gravity.

a) Make a table for $0 \leq t \leq 9$. Use 0.5 s intervals.

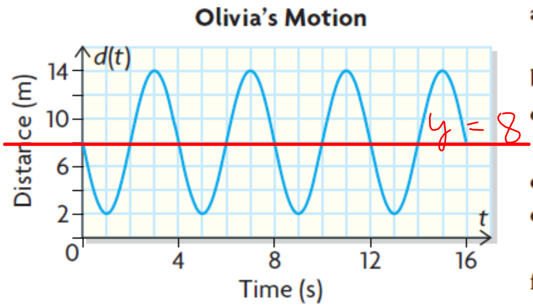
b) Draw the graph.

c) Explain why the function models periodic behaviour.

d) What is the relationship between the amplitude of the function and the displacement of the spring from its rest position?

p. 370

1. Olivia was swinging back and forth in front of a motion detector when the detector was activated. Her distance from the detector in terms of time can be modelled by the graph shown.



a) What is the equation of the axis, and what does it represent in this situation? *y = 8 ; represents the midpoint of the swing; i.e. at rest*

b) What is the amplitude of this function? *→ a = 6*

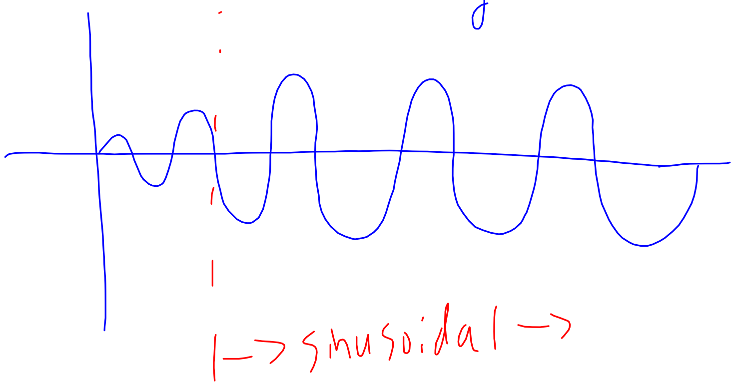
c) What is the period of this function, and what does it represent in this situation? *4 sec. rep. 1 complete swing to & fro.*

d) How close did Olivia get to the motion detector? *2 m*

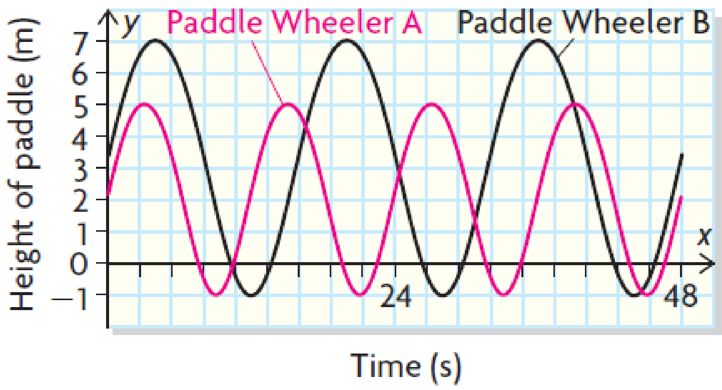
e) At $t = 7$ s, would it be safe to run between Olivia and the motion detector? Explain your reasoning. *Yes, Olivia is at the furthest away from the sensor (on her backswing)*

f) If the motion detector was activated as soon as Olivia started to swing from at rest, how would the graph change? (You may draw a diagram or a sketch.) Would the resulting graph be sinusoidal? Why or why not?

Only sinusoidal once Olivia gets to a "full" swing



p. 370 **2.** Marianna collected some data on two paddle wheels on two different boats and constructed two graphs. Analyze the graphs, and explain how the wheels differ. Refer to the radius of each wheel, the height of the axle relative to the water, the time taken to complete one revolution, and the speed of each wheel.



Wheeler A

radius is 3 m

axel height relave to the water is 2 m

me for 1 revoluon is 12 seconds

speed of the wheel: $S = \frac{d}{t}$

$= \frac{2\pi(3)}{12}$

$= 1.57\ m/s$

Wheeler B

radius is 4 m

axel height relave to the water is 3 m

me for 1 revoluon is 16 seconds

speed of the wheel: $S = \frac{d}{t}$

$= \frac{C}{t}$

$= \frac{2\pi r}{t}$

$= \frac{2\pi(}{16}$

$= 1.57\ m/s$

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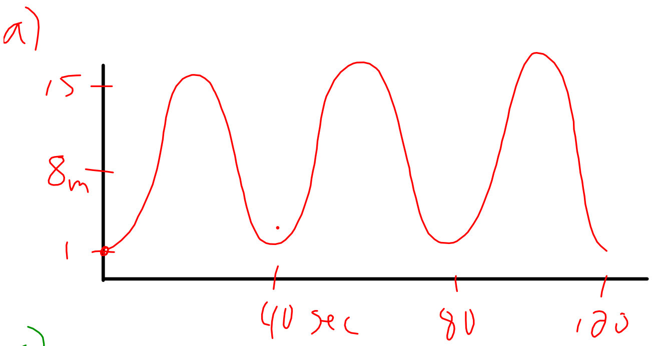
6. Sketch a height-versus-time graph of the sinusoidal function that models each situation. Draw at least three cycles. Assume that the first point plotted on each graph is at the lowest possible height.

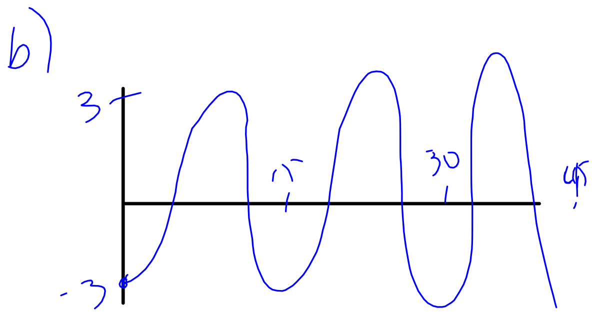
a) A Ferris wheel with a radius of 7 m, whose axle is 8 m above the ground, and that rotates once every 40 s

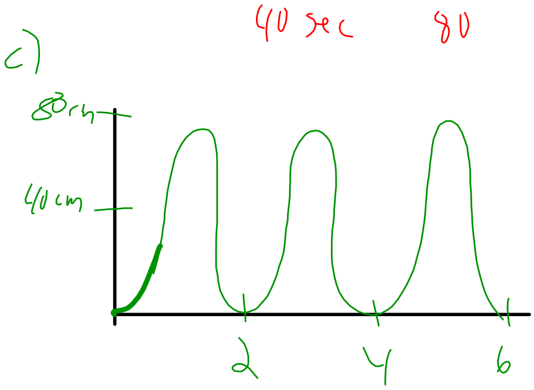
b) A water wheel with a radius of 3 m, whose centre is at water level, and that rotates once every 15 s

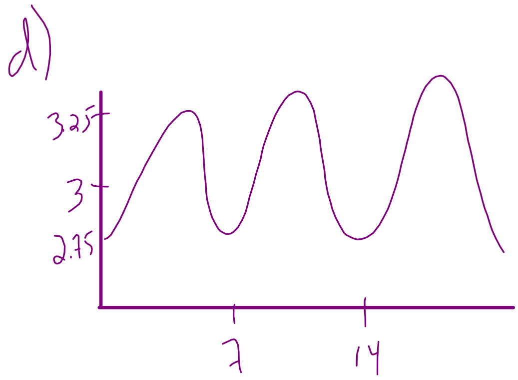
c) A bicycle tire with a radius of 40 cm and that rotates once every 2 s

d) A girl lying on an air mattress in a wave pool that is 3 m deep, with waves 0.5 m in height that occur at 7 s intervals









p. 372

8. The diameter of a car's tire is 52 cm. While the car is being driven, the tire picks up a nail.

T

- **a)** Draw a graph of the height of the nail above the ground in terms of the distance the car has travelled since the tire picked up the nail.
- **b)** How high above the ground will the nail be after the car has travelled 0.1 km?
- **c)** How far will the car have travelled when the nail reaches a height of 20 cm above the ground for the fifth time?
- **d)** What assumption must you make concerning the driver's habits for the function to give an accurate height?

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6.4 Exploring Transformations of Sinusoidal Functions

Date: Dec. 2/19

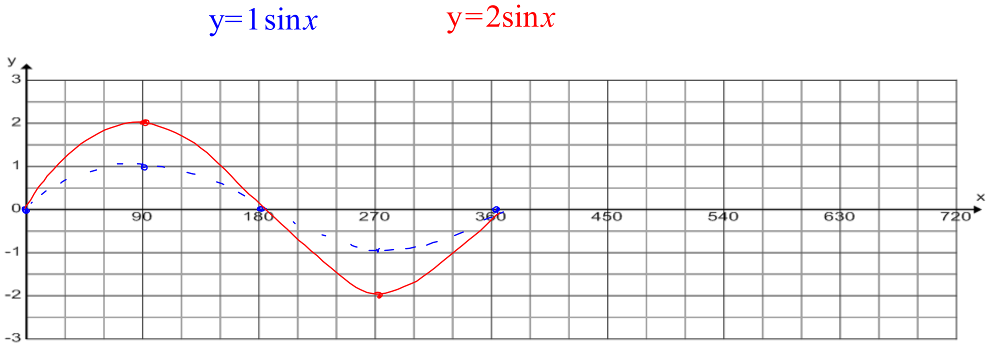
***EXPLORE** the Math*: pp. 377-378 A-U

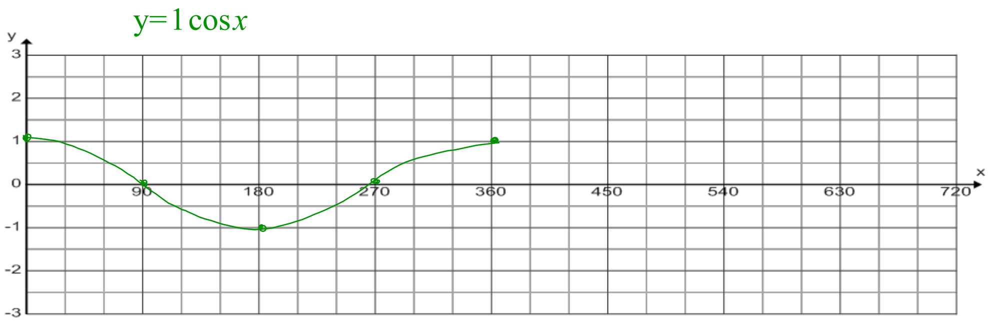
Part 1: The Graphs of $y = a\sin x$ and $y = a\cos x$.

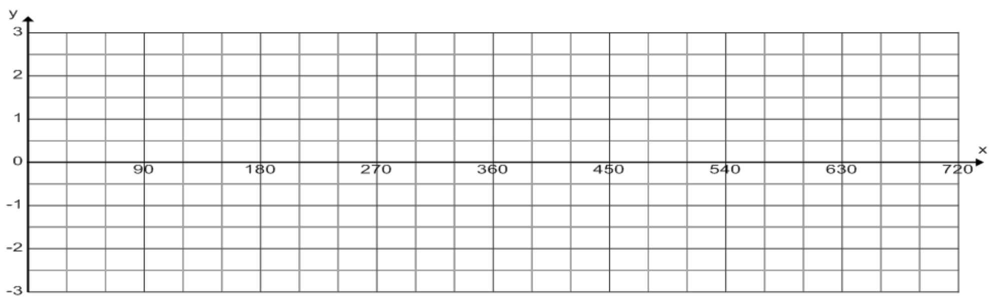
Start with the 5 Key Points from the parent function.

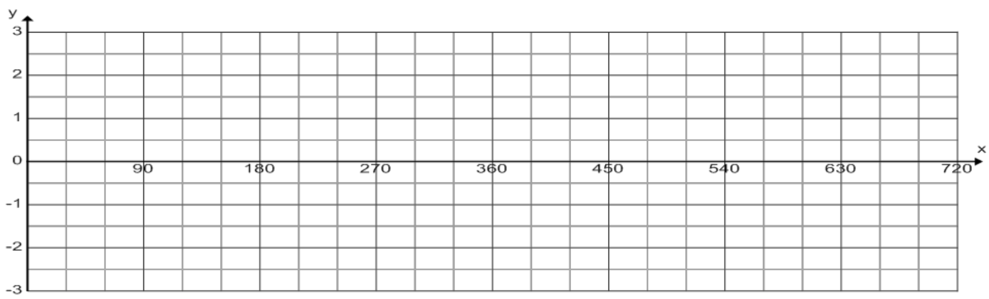
You may choose to add a few more for accuracy.

Note: Only 1 complete cycle is required.

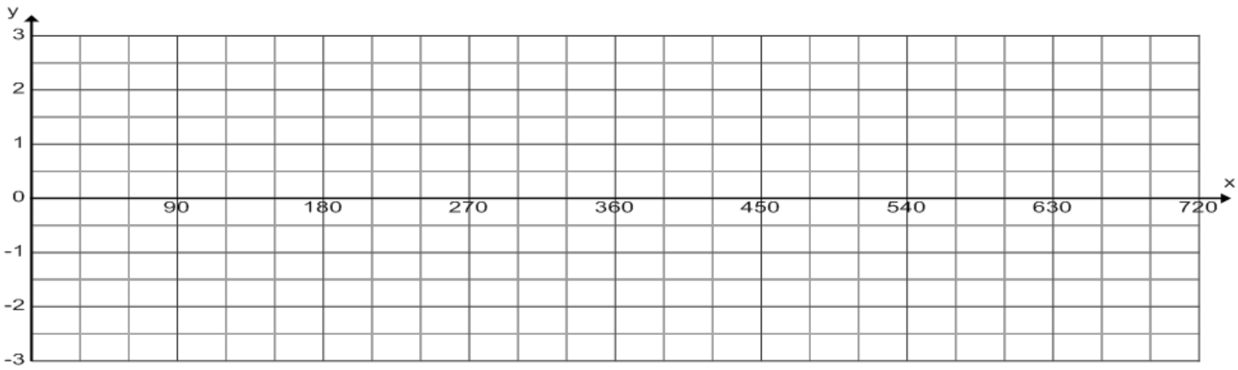


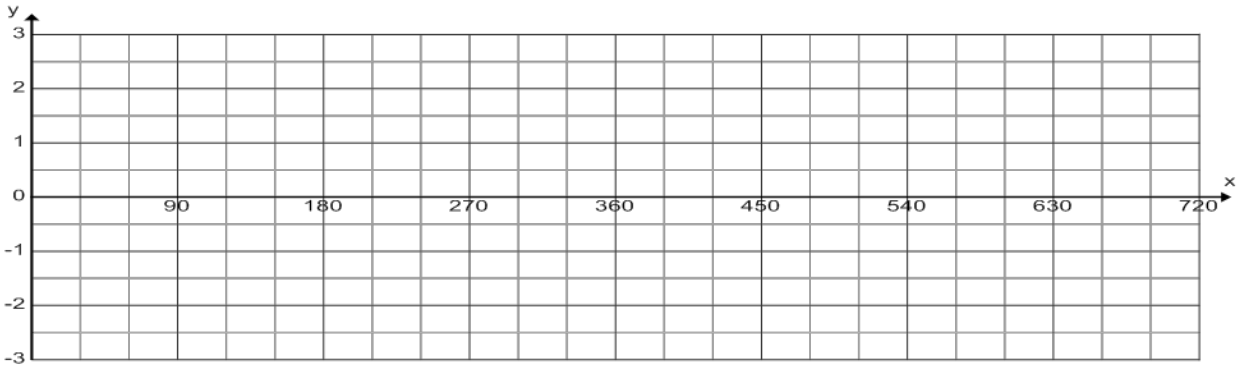




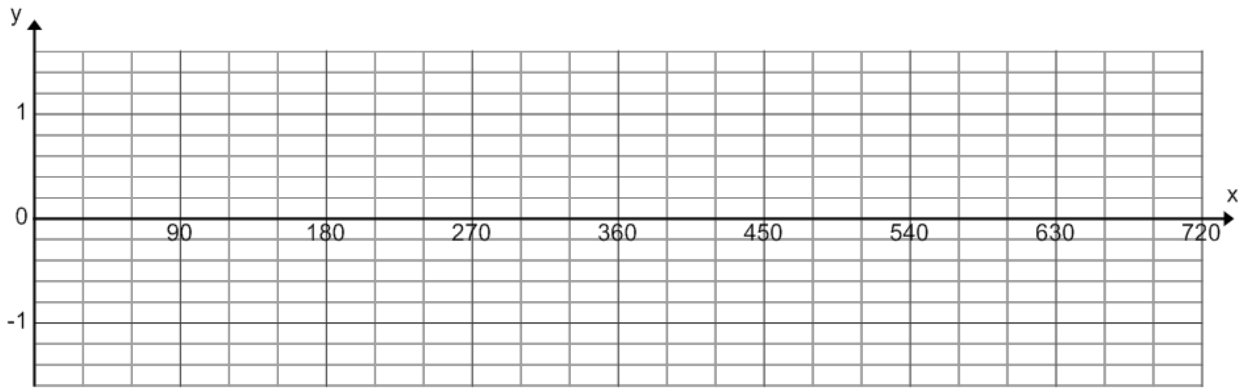


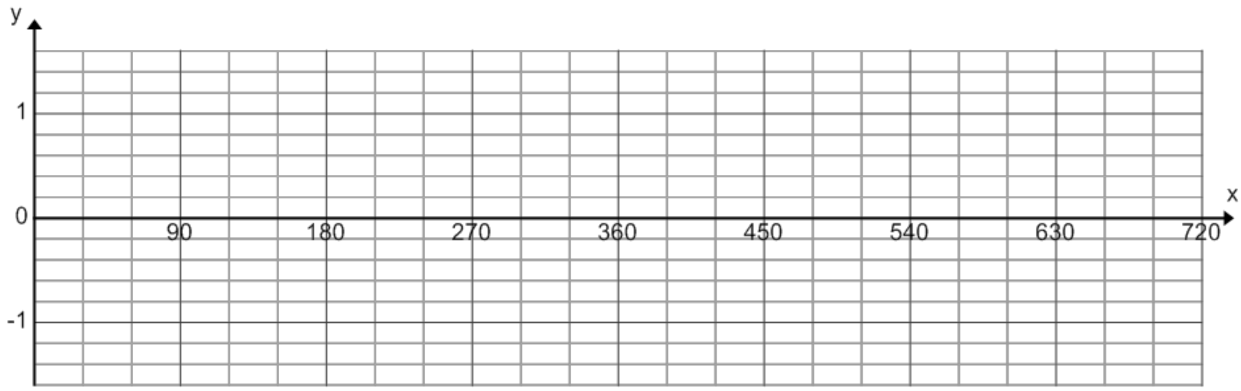
Part 2: The Graphs of $y = \sin x + c$ and $y = \cos x + c$.



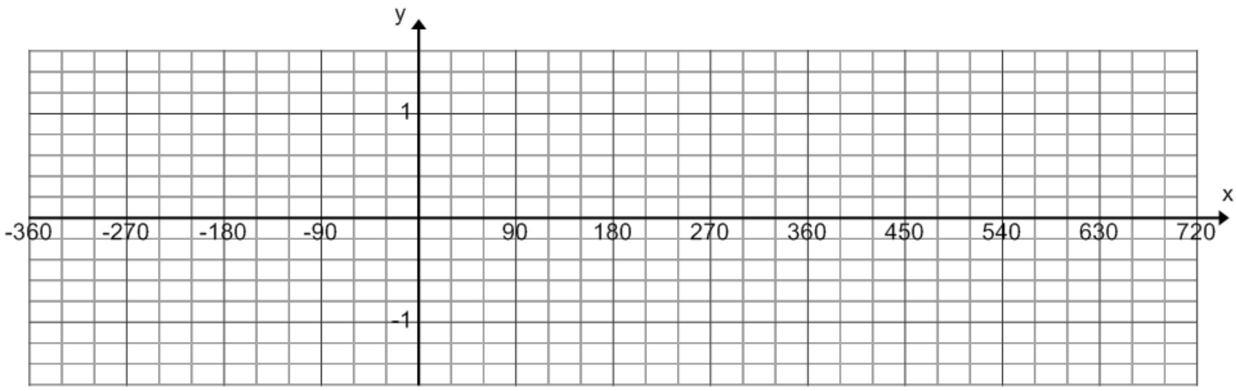


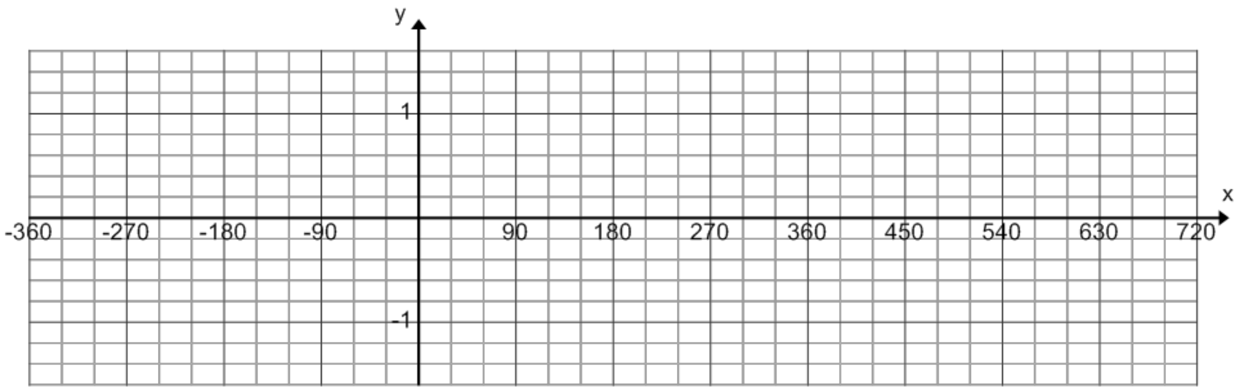
Part 3: The Graphs of $y = \sin kx$ and $y = \cos kx$.





Part 4: The Graphs of $y = \sin(x - d)$ and $y = \cos(x - d)$.





Summary of $y = a\sin\left(k\left(x-d\right)\right)+c$ and $y = a\cos\left(k\left(x-d\right)\right)+c$

The transformations that have occurred to $\boldsymbol{y = \sin x}$ and $\boldsymbol{y = \cos x}$ are:

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 363-364 #1 – 4, 8, 9 [15,16]
pp. 370-372 #1 – 8, 13 [15]

Today's Homework Practice includes:

pp. 377-378 A – U

p. 379 #1 – 3

6.2 SineTracer.gsp