Introduction to periodic functions

http://www.youtube.com/watch?v=Ns03ndh5Zzk

Watch the video and try to explain the basic terms connected to periodic functions.

1) What is a Periodic Function?

....

2) What is the Period of a function?

....

3) What is the Period of a basic sine and cosine function?

....

4) What is the Frequency of a function?

....

5) What is the Phase Shift of a function?

....

6) What is the Amplitude of a function?

....

7) What is the Vertical Shift of a function?

....

Section 2 Development

2. Read this:

- In the set of real numbers, how large is the highest number?
  However large a number is, there is always a higher number.
- In the set of numbers <1, what number is the highest member of the set?
  Whatever number we choose, there is always a higher number in the set.
- How many points are there on a line?
  However many points we choose, there are always more points.

Now make correct statements from the table:

In the set of real numbers		large we make one angle	there is always a smaller value.
On a line		distance we take between two points	the sum does not reach one.
In the set $x>0$	however	small a number is	there is always a shorter distance.
In the series $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots$	whatever	many values we add	it cannot be more than 180°.
In the series $\sqrt{2}, \sqrt[3]{2}, \sqrt[4]{2}, \sqrt[5]{2}, \ldots$		root of 2 is taken	there is always a smaller number.
In a triangle		value of x we take	its value is always greater than one.

3. Look and read:

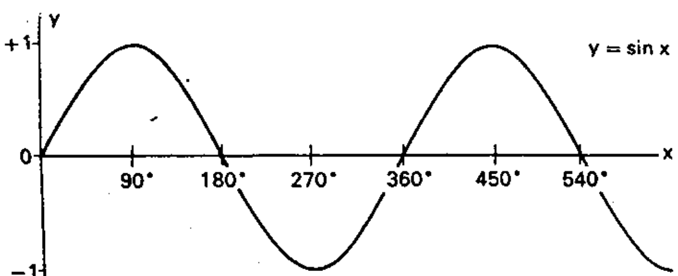


Fig. 6.1

Figure 6.1 is a graph of the function y = sin x. As x goes from 0° to 90°, sin x increases from 0 to 1. As x goes from 90° to 270°, sin x

periodic function, with a period of 360°, i.e. the graph repeats itself every 360°.

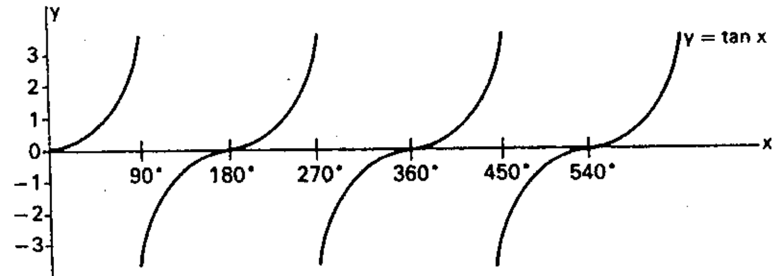


Fig. 6.2

Figure 6.2 is a graph of the function y = tan x. As x approaches 90°, tan x tends to infinity. After 90°, tan x reappears on the negative side. As x goes from 90° to 180°, tan x increases to 0. As x approaches 270°, tan x again tends to infinity, reappearing again after 270° on the negative side. The tangent function is a periodic function, with a period of 180°, i.e. the graph repeats itself every 180°.

Now describe the following trigonometrical functions:

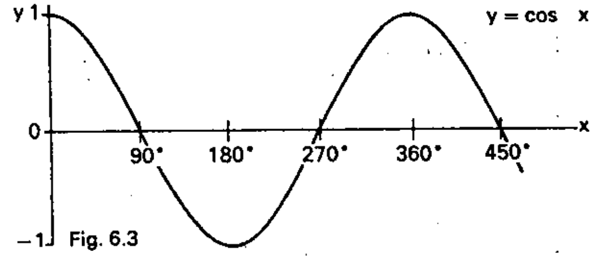


Fig. 6.3

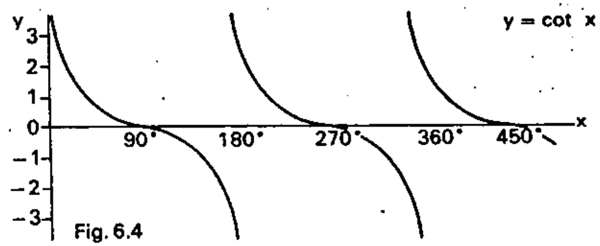


Fig. 6.4

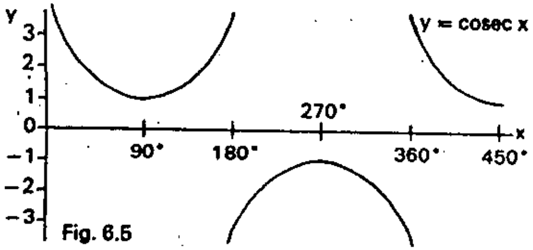


Fig. 6.5

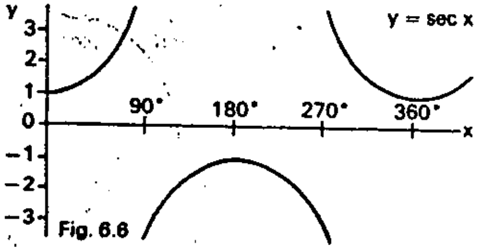


Fig. 6.6

Section 3 Reading

4. Read this:

Convergence and divergence

An expression of the form $a_1 + a_2 + a_3 + a_4 + \ldots\ldots + a_n + \ldots\ldots$ is called an *infinite series*, or simply a *series*. $a_1, a_2, a_3, a_n, \ldots\ldots$ are called, respectively, the first, second, third, nth, etc. *terms*. Each term in a series can be calculated from the preceding term by using a given rule. For example, in the series $1+2+3+4+\ldots\ldots$, each term is found by adding one to the preceding term.

Although the number of terms in a series is infinite, the sum of the terms may have a finite *limit*. For example, the sum of the series $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots\ldots$, where each term is found by multiplying the preceding term by $\frac{1}{2}$, gets nearer and nearer to 2 but never reaches it. 2 is consequently said to be the limit of the series, and the series is said to be *convergent*.

A series in which the sum does not tend to a finite limit is said to be *divergent*, as in the series $1+2+3+4+\ldots\ldots$

In all convergent series, the terms get closer and closer to zero, but not all series in which the terms get closer and closer to zero are convergent. For example the terms of the series $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\ldots\ldots$ get closer and closer to zero, but the sum increases without bound. This can be seen if we re-write the series as $1+\frac{1}{2}+(\frac{1}{3}+\frac{1}{4})+(\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8})+(\frac{1}{9}+\frac{1}{10}+\ldots\ldots+\frac{1}{16})+(\frac{1}{17}+\frac{1}{18}+\ldots\ldots\frac{1}{32})+\ldots\ldots$. Each sum in the brackets is greater than $\frac{1}{2}$, so the sum of the series is always greater than $1+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\ldots\ldots$, and the series is divergent.

Say whether the following statements are true or false. Correct the false statements.

a) Any term in a series is always positive.
b) All series are either convergent or divergent.
c) A convergent series increases without bound.
d) The sum of the series $1+\frac{1}{2}+\frac{1}{4}+\ldots\ldots$ tends to zero.
e) Whatever term in a series we choose, it is always possible to add more terms.
f) In convergent series, the terms get smaller.

Section 4 Listening

Stationary points

5. Listen to the passage and write down the word in each of the following pairs which occurs in the passage:

axis/axes
squared/square
step/steep
kinds/kind
a local/local
inflexion/infliction

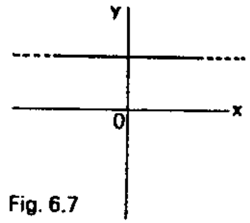


Fig. 6.7

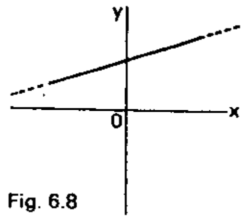


Fig. 6.8

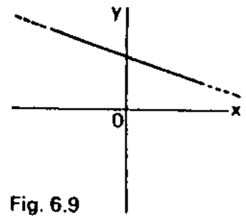


Fig. 6.9

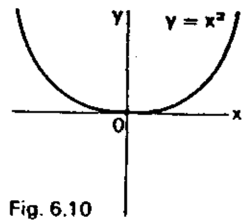


Fig. 6.10

6. Complete this table:

	Gradients	
	Before	After
Maximum	+	−
Minimum		
Point of inflexion Either		
Or		

Consider these statements:

A dog is an animal
A cat is an animal
Therefore a dog is a cat

Which two mathematical symbols can be used for the different meanings of 'is' to enable us to see the *flaw* in the above argument?

Unit 6 Process 2 Actions in Sequence

Section 1 Presentation

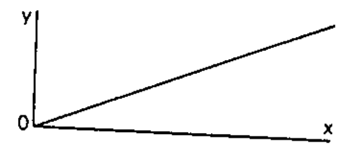
1. Look and read:

$1+2+3+4+5+6+\ldots\ldots$

- As successive values are added to this series, so the sum gets larger and larger.

$\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\ldots\ldots$

- As successive values are added to this series, so the sum approaches 1.



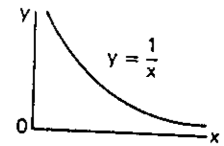
- As x becomes larger, so y becomes larger.

Complete the following sentences in the same way:

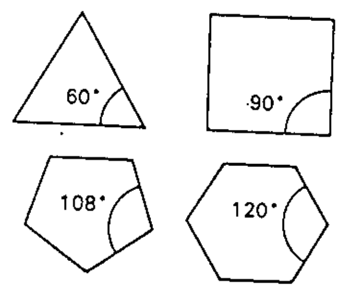
$2+4+8+16+32+\ldots\ldots$ a) As successive values ......

$1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\ldots\ldots$ b) As successive values ......

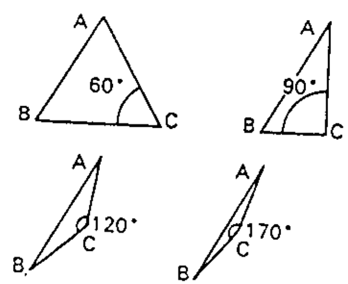
$1!+2!+3!+4!+5!+\ldots\ldots$ c) As successive values ......



d) As x becomes larger, ...
e) As x becomes smaller, ...



f) As the number of sides of regular polygons is increased, so the angles ......



g) As angle C approaches 180°, so angles A and B ......