Mathematics Grade 11

Trigonometry Graphs Summary

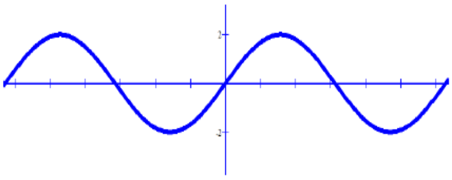
Three basic Trig Functions are

1. $y = a \sin x$
2. $y = a \cos x$
3. $y = \tan x$

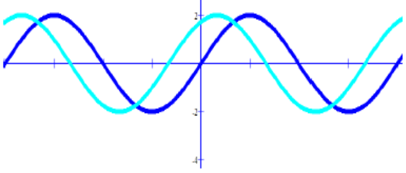
WHERE a REPRESENTS THE AMPLITUDE OF THE GRAPH OF SIN AND COS

Example 1

a. Y = 2 sin x



b. Y = 2 sin (x +30⁰) (with the previous graph showing the shift of 30⁰ to the left.



- Amplitude = 2
- Range [-2;2] – y-values
- Domain [-360^0; 360^0]
- Period

for sin and cos

(how many degrees it takes to complete a complete graph) $\frac{360°}{\textit{value in front of } x}$

IN THIS CASE THERE IS 1 BEFORE x BECAUSE THERE IS NO NUMBER SHOWN

$$\frac{360°}{1} = 360°$$

$y = a \sin b(x+p) + q$

a	Amplitude
b	Compress the graph of f(x) horizontally by a factor of b. For Trig graphs it will decrease the period.
p	Shifts the graph left or right by p units (if p is positive then it will shift left)
q	Shifts the graph up or down by q units

- To work out your critical values (values where the graph cuts the x-axis – **the intervals**)

$$Period = \frac{360°}{b}$$

$$Intervals = \frac{Period}{4}$$

$y = a \tan b(x+p) + q$

a	The value of a affects the y-value of each point. Each y-value is multiplied by a.
b	Compress the graph of f(x) horizontally by a factor of b. For Trig graphs it will decrease the period.
p	Shifts the graph left or right by p units (if p is positive then it will shift left)
q	Shifts the graph up or down by q units

- To work out your critical values (values where the graph cuts the x-axis – **the intervals**)

$$Period = \frac{180°}{b}$$

$$Intervals = \frac{Period}{4}$$

$y = a \cos b(x+p) + q$

a	Amplitude
b	Compress the graph of f(x) horizontally by a factor of b. For Trig graphs it will decrease the period.
p	Shifts the graph left or right by p units (if p is positive then it will shift left)
q	Shifts the graph up or down by q units

- To work out your critical values (values where the graph cuts the x-axis – **the intervals**)

$$Period = \frac{360°}{b}$$

$$Intervals = \frac{Period}{4}$$

Exercise 2

Consider the following Trig Functions and work out the period of each:

1. Y = sin 2x
2. Y = 2 cos 3x
3. Y= 3 cos 2x
4. Y = 2 tan 2x

- Period

for sin and cos

$$\frac{360°}{\textit{value in front of } x}$$

for tan

$$\frac{180°}{\textit{value in front of } x}$$

CHANGES IN GRAPHS (WILL APPLY TO ANY GRAPH FUNCTION)

If f(x) = sin x

Function change	Shift	Example
f(x) + c	Shift the graph of f(x) up c units	F(x) = sin x + c
f(x) - c	Shift the graph of f(x) down c units	F(x) = sin x - c
f(x + c)	Shift the graph of f(x) left c units	F(x) = sin (x + c)
f(x - c)	Shift the graph of f(x) right c units	F(x) = sin (x - c)
-f (x)	Reflect the graph of f(x) about the x-axis	F(x) = - sin x
f (-x)	Reflect the graph of f(x) about the y-axis	F(x) = sin (-x)
f(c.x)	Compress the graph of f(x) horizontally by a factor of c. For Trig graphs it will decrease the period.	F(x) = sin (c.x)
c.f(x)	Stretch the graph of f(x) vertically by a factor of c. For Trig graphs it will increase the amplitude.	F(x) = c. sinx

Example 3

Given y = cos x, complete the following table:

Function change	Shift
f(x) + 3	
f(x) – 2	
f(x + 30^0)	
f(x - 45^0)	
-f (x)	
f (-x)	
f(2.x)	
3.f(x)	

:

- Period
  for sin and cos

  $$\frac{360°}{value\ in\ front\ of\ x}$$

  for tan

  $$\frac{180°}{value\ in\ front\ of\ x}$$