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**Study Guide**

**Mathematics**

**Grade 10**

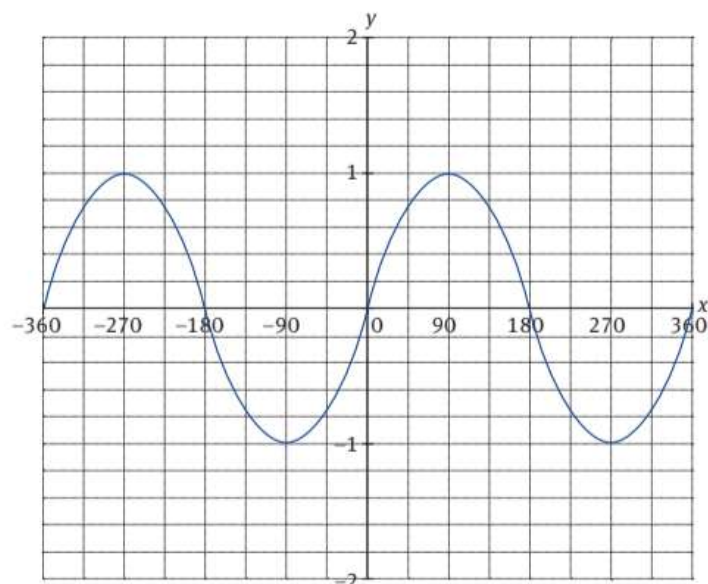


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# Graphs of the trigonometric functions

## 7.1 The sine and cosine graphs

1.  $y = \sin \theta$



The graph repeats itself every  $360^\circ$

Domain: All real numbers

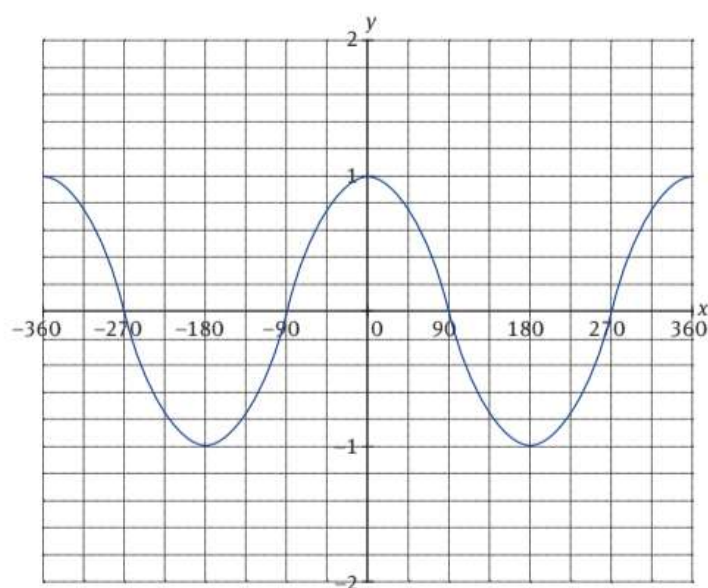
Range:  $[-1, 1]$

Maximum value: 1 when  $\theta = -270^\circ; 90^\circ$

Minimum value: -1 when  $\theta = -90^\circ; 270^\circ$

Zero: when the graph cuts the  $\theta$ -axis, i.e. when  $\theta = -360^\circ; -180^\circ; 0^\circ; 180^\circ; 360^\circ$

2.  $y = \cos \theta$



The graph repeats itself every  $360^\circ$

Domain: All real numbers

Range:  $[-1, 1]$

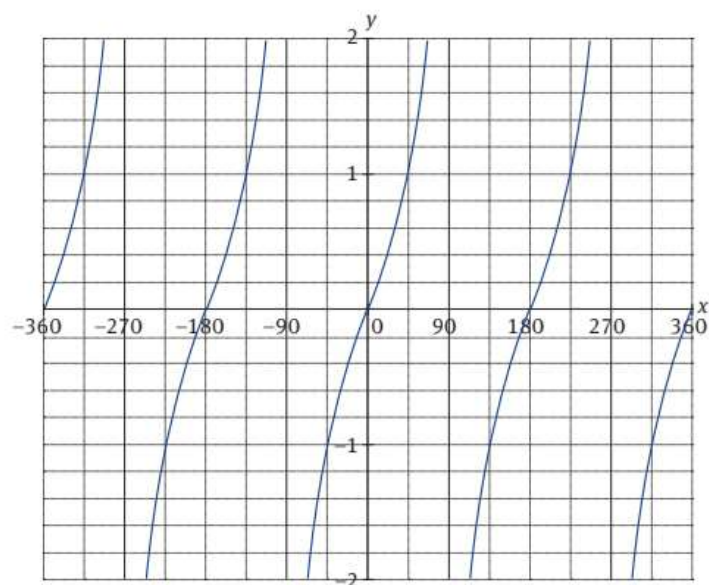
Maximum value: 1 when  $\theta = -360^\circ; 0^\circ; 360^\circ$

Minimum value: -1 when  $\theta = -180^\circ; 180^\circ$

Zero: when the graph cuts the  $\theta$ -axis, i.e. when  $\theta = -270^\circ; -90^\circ; 90^\circ; 270^\circ$

## 7.2 The tan graph

1.  $y = \tan \theta$



The graph repeats itself every  $180^\circ$

No maximum or minimum turning points

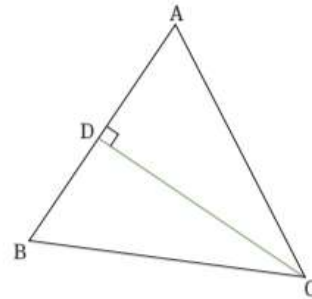
Zero: when the graph cuts the  $\theta$ -axis, i.e. when  $\theta = -360^\circ; -180^\circ; 0^\circ; 180^\circ; 360^\circ$

Asymptotes: at  $\theta = -270^\circ; -90^\circ; 90^\circ; 270^\circ$

## Questions

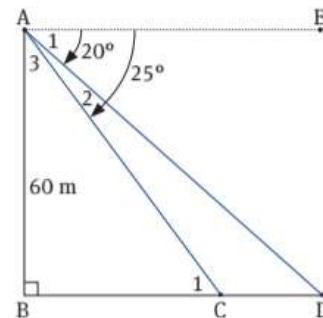
- 1 In  $\triangle ABC$ ,  $DC$  is perpendicular to  $AB$ ,  $\angle A = 55^\circ$ ,  
 $AD = BD$  and  $DC = 15$  cm.  
 (Use your calculator to answer following questions.)

- Find the length of  $AD$  and then  $AB$ .
- Find the length of  $AC$ .
- Find the length of  $BC$ . (What does your answer imply about  $\triangle ABC$ ?)
- Find  $\angle DBC$ .



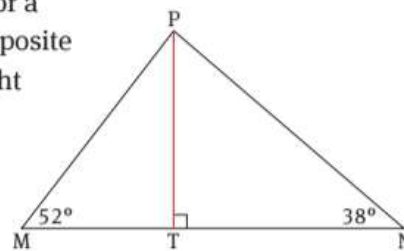
- 2 A rocket is launched vertically and changes direction through an angle of  $55^\circ$  to the vertical line after 2 minutes. If the average speed of the rocket is 6 000 km/h, calculate:
- The height of the rocket after 2 minutes.
  - The height of the rocket after 3 minutes.
  - The horizontal distance from A, the launching tower, to B, a point directly under the rocket after 3 minutes.

- 3 From the top of a perpendicular cliff,  $AB$ , 60 m above sea level, the angles of depression to two boats at  $C$  and  $D$ , in the same vertical plane as  $B$ , are  $20^\circ$  and  $25^\circ$ , respectively.  
 Calculate the distance between the two boats at  $C$  and  $D$  (correct to one decimal place).



- 4 In the figure,  $M$  and  $N$  represent service vehicles for a cellular telephone company and are parked on opposite sides of a cellular phone mast,  $PT$ .  $MTN$  is a straight line. The angles of elevation of mast  $PT$  from the vehicles  $M$  and  $N$  are  $52^\circ$  and  $38^\circ$  respectively.  
 If  $MTN = 160$  m, calculate:

- the magnitude (size) of  $\angle MPN$
- the length of  $MP$ , to the nearest metre
- the height of the mast  $PT$ , to the nearest metre



5 Use your calculator to solve the following equations, correct to two decimal numbers ( $0^\circ \leq x \leq 90^\circ$ ).

a  $\sin x = 0,57$

b  $3\cos x = 0,96$

c  $\frac{2}{3}\tan x = 4,2$

d  $\sin(x + 25^\circ) = 0,813$

e  $\tan x = \sin 42^\circ$

6 Using the special angles, solve the following equations for  $0^\circ \leq x \leq 90^\circ$ .

a  $2\sin x = \sqrt{3}$

b  $\cos 3x = \frac{1}{2}$

c  $4\sin(2x - 10^\circ) - 1 = 1$

d  $x \cdot \tan 60^\circ = \cos 30^\circ$