

# **Principles of Mathematics 12**

## **Review Sheets**

Graphing Trigonometric Functions & Solving Trigonometric  
Equations

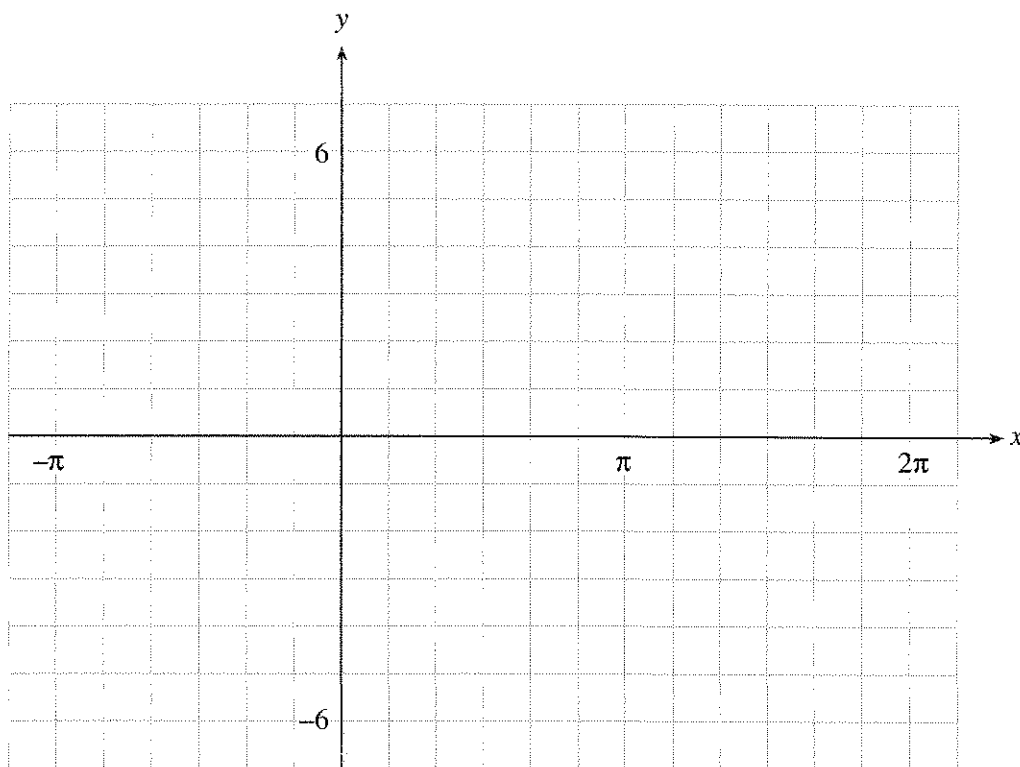
6. A minimum value of a sinusoidal function is at  $\left(\frac{\pi}{4}, 3\right)$ . The nearest maximum value to the right of this point is at  $\left(\frac{7\pi}{12}, 7\right)$ . Determine an equation of this function. **(3 marks)**

7. The two smallest positive solutions of  $\cos 4x = 0.6$  are  $x = 0.23$  and  $x = 1.34$ .  
Determine the general solution for  $\cos 4x = 0.6$ .

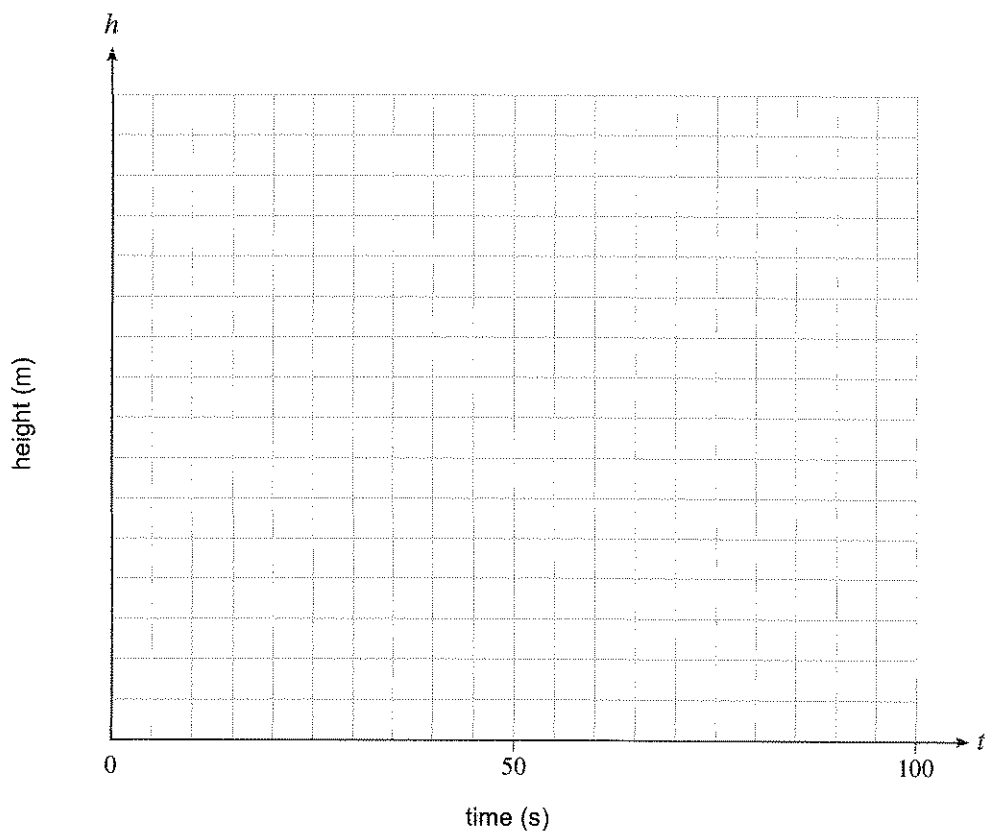
**(1 mark)**

6. A sinusoidal curve has a minimum point at  $\left(-\frac{\pi}{3}, -5\right)$  and the closest maximum point to the right is  $\left(\frac{\pi}{6}, 3\right)$ . Determine an equation of this curve. (4 marks)

A grid is provided for rough work only.



4. A Ferris wheel with a radius of 30 m rotates once every 100 s. At time  $t = 0$  s, passengers get on at the lowest point of its rotation which is 5 m above the ground.
- a) Using the grid below, graph how the height  $h$  of a passenger varies with respect to the elapsed time  $t$  during at least one rotation of the Ferris wheel. Clearly show at least 5 points on your graph and indicate the scale on the vertical axis. **(2 marks)**



- b) Determine a sine function that gives the passenger's height  $h$  metres, above the ground as a function of time  $t$  seconds. **(2 marks)**

ANSWER:

6. A mass is supported by a spring so that it rests 50 cm above a table top, as shown in the diagram below. The mass is pulled down to a height of 20 cm above the table top and released at time  $t = 0$ . It takes 0.8 seconds for the mass to reach a maximum height of 80 cm above the table top. As the mass moves up and down, its height  $h$ , in cm, above the table top, is approximated by a sinusoidal function of the elapsed time  $t$ , in seconds, for a short period of time.

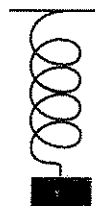


table top

Determine an equation for a sinusoidal function that gives  $h$  as a function of  $t$ . (4 marks)

7. A Ferris wheel has a radius of 25 m and its centre is 27 m above the ground. It rotates once every 40 seconds. Sandy gets on the Ferris wheel at its lowest point and then the wheel starts to rotate.

a) Determine a sinusoidal equation that gives Sandy's height,  $h$ , above the ground as a function of the elapsed time,  $t$ , where  $h$  is in metres and  $t$  is in seconds. **(3 marks)**

b) Determine the first time,  $t$  (in seconds), when Sandy will be 35 m above the ground. **(1 mark)**

7. Solve the following equation algebraically.

(4 marks)

$$3\cos^2 x + \cos x - 2 = 0,$$

$$0 \leq x < 2\pi$$

6. Solve algebraically, giving exact values, where  $0 \leq x < 2\pi$ .

(4 marks)

$$2 \tan x \sin x - \tan x = 0$$

7. a) Solve algebraically, giving exact values for  $x$ , where  $0 \leq x < 2\pi$ .

(3 marks)

$$2\sin^2 x - \sin x = 0$$

- b) Give the general solution for this equation. (Solve over the set of real numbers, giving exact value solutions.)

(1 mark)

7. a) Solve algebraically, giving exact values for  $x$ , where  $0 \leq x < 2\pi$ .

(3 marks)

$$2\cos^2 x - \cos x - 1 = 0$$

b) Give the general solution for this equation. (Solve over the set of real numbers, giving exact value solutions.)

(1 mark)

5. Determine the general solution algebraically. (Solve over the set of real numbers.)

$$3\cos^2 x - 8\cos x + 4 = 0$$

(Answer accurate to at least 2 decimal places.)

**(4 marks)**

Use the following equation to answer questions 7 and 8.

$$2\cos^2 x + 3\cos x + 1 = 0$$

7. Solve the equation algebraically, giving exact values for  $x$ , where  $0 \leq x < 2\pi$ . (4 marks)

8. Give the general solution for this equation.  
(Solve over the set of real numbers giving exact value solutions.) (1 mark)