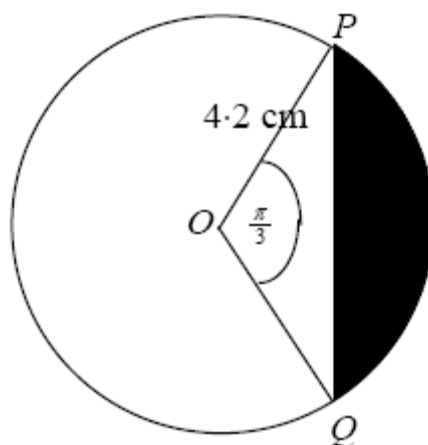
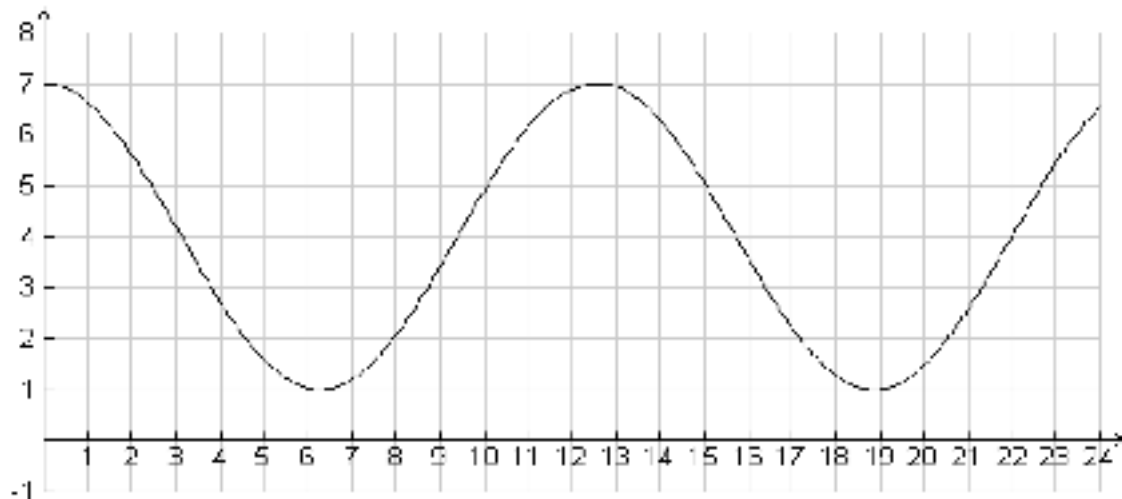


1. Find the shaded area in the diagram below. [5]



2. Describe the simple geometrical transformation that maps  $y = \sin x$  onto  $y = 4 + \sin \frac{1}{2}x$ . [4]
3. In the triangle  $ABC$ ,  $AB = 5$  cm,  $BC = 6$  cm, and angle  $\hat{C}AB = 20^\circ$ . Find the size(s) of the angle  $\hat{B}CA$ . [4]
4. The angle  $\theta$  radians satisfies the equation,  $3 \tan \theta = 2 \cos \theta$ .
- a) Show that  $3 \sin \theta = 2 \cos^2 \theta$ . [1]
- b) Solve the equation  $3 \sin \theta = 2 \cos^2 \theta$ , that lie in the interval between  $0^\circ \leq x \leq 180^\circ$ . [5]
- c) Hence solve the equation of  $3 \tan 2x = 2 \cos 2x$  that lie in the interval between  $0^\circ \leq x \leq 180^\circ$ . [3]
5. a) Express  $4 \sin \theta - 3 \cos \theta$  in the form  $R \sin(\theta - \alpha)$ , where R is a positive constant and  $0 \leq \alpha \leq \frac{\pi}{2}$ . [3]
- b) Hence find the solutions in the interval  $0 \leq \theta \leq 2\pi$  of the equation,  $4 \sin \theta - 3 \cos \theta = 2$ , without the aid of a GDC. [4]

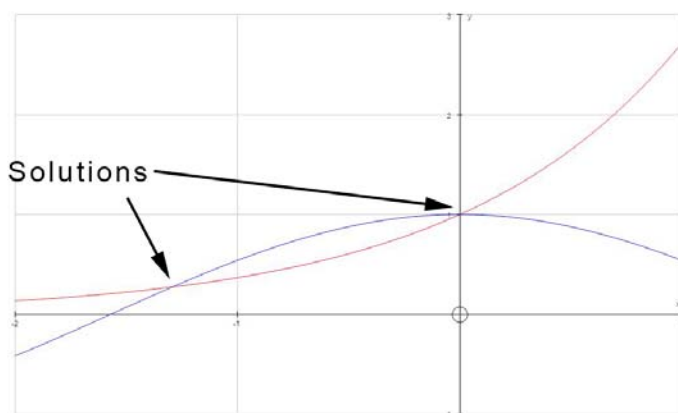
6. The height of the water in a harbour in 24 hours is modelled by a trigonometric equation. The graph of the equation has been shown below, where the  $x$  axis represents the hours and the  $y$  axis is the height of the water in metres. The day starts at midnight.



- a) Find the range and domain of the equation used. [4]
  - b) Find the height of the water at 06 00. [1]
  - c) Find the time(s) when the height of the water is 5 metres. [2]
  - d) The equation is written in the form  $y = k + c (\cos 30x)$ , where  $k$  and  $c$  are constants. Find the value of both  $k$  and  $c$ . [4]
7. If  $\sin A = \frac{2}{3}$  and  $A$  is obtuse, find the exact values of:
- a)  $\cos A$ , [2]
  - b)  $\sin 2A$ , [2]
  - c)  $\tan 2A$ . [4]
8. a) Draw a sketch of the graphs of  $y=e^x$ , and  $y = \cos x$ , for  $-2 \leq x \leq 1$ . [4]
- b) Indicate clearly on your diagram where the solutions to the equation,  $e^x = \cos x$ , lies. [1]
  - c) Write down the solutions to  $e^x = \cos x$ . [2]

Answers

1.  $1.598 \text{ cm}^2$
2. Translation by the vector  $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$  and stretch by 2 units horizontally.
3.  $\theta = 16.6^\circ$
4. b)  $\theta = 30^\circ, 150^\circ$   
 c)  $x = 15^\circ, 165^\circ$
5. a)  $5 \sin(\theta - 0.644)$   
 b)  $\theta = 1.055, 3.374$
6. a) domain is 0 to 24, range is 1 to 7 inclusive.  
 b) 1 m  
 c) 0230, 1000, 1500, 2230  
 d)  $y = 4 + 3 \cos(30x)$
7. a)  $\cos x = \frac{\sqrt{5}}{3}$   
 b)  $\sin 2x = \frac{4\sqrt{5}}{9}$
8. a) and b)



- c)  $x = -1.293$  and  $x = 0$