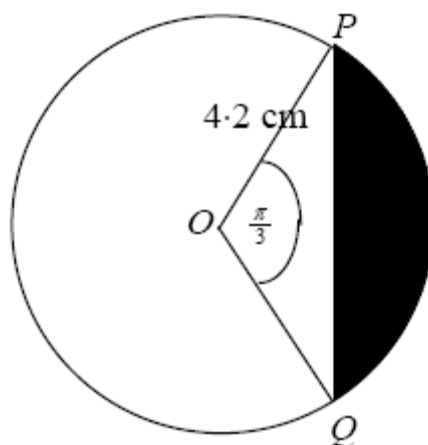
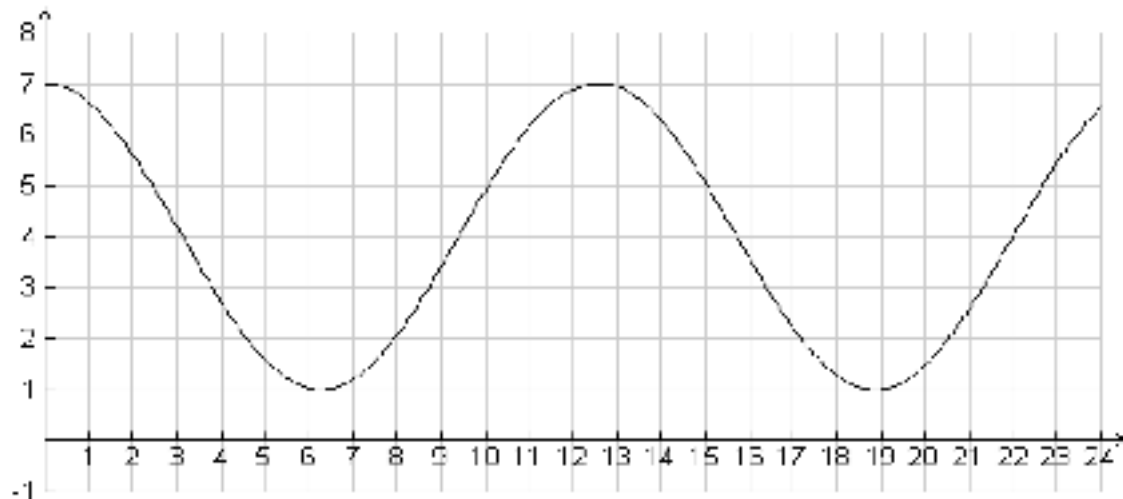


1. Find the shaded area in the diagram below. [5]



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. Solve the equation $2\cos^2 x = \sin 2x$ for $0 \leq x \leq \pi$. Give your answer as an exact number. [4]
5. a) Draw a sketch of the graphs of $y = e^x$, and $y = \cos x$, (x is a radian measure) for $-2 \leq x \leq 1$. [4]
- b) Indicate clearly on your diagram where the solutions to the equation,
- $$e^x = \cos x, \text{ lies.} \quad [1]$$
- c) Write down the solutions to $e^x = \cos x$. [2]

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 . [2]
7. If $\sin A = \frac{2}{3}$ and A is obtuse, find the exact values of,
- a) $\cos A$, [2]
- b) $\sin 2A$, [2]
8. The angle θ 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]

Answers

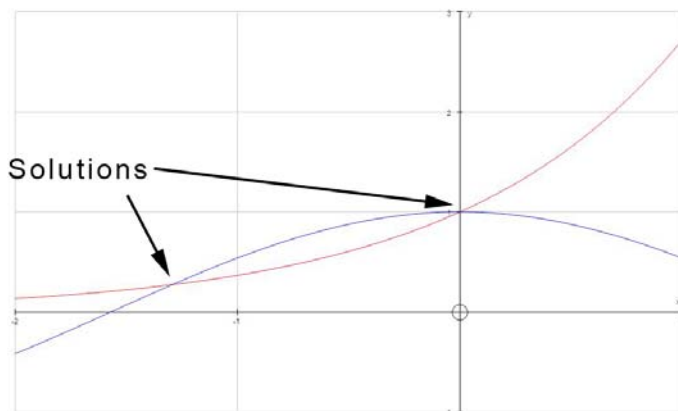
1. 1.598 cm^2

2. Translation by the vector $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$ and stretch by 2 units horizontally.

3. $\theta = 16.6^\circ$

4. $x = \frac{\pi}{4}$

5. a) and b)



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

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. b) $\theta = 30^\circ, 150^\circ$

c) $x = 15^\circ, 165^\circ$