

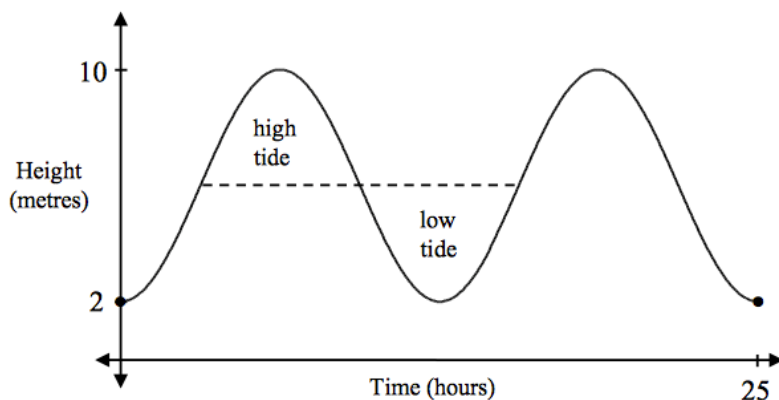
Trigonometric Functions

January 2014

Question 33

a) 1 mark b) 2 marks

The following graph represents tidal levels in the Bay of Fundy over a 25-hour period.



Solution

a) 6 metres

1 mark

$$\begin{aligned} \text{b) Period} &= \frac{25}{2} \\ &= 12.5 \text{ hours} \end{aligned}$$

1 mark for period

The period represents the time to complete one cycle of tidal levels in the Bay of Fundy.

1 mark for explanation

2 marks

Question 43**4 marks**

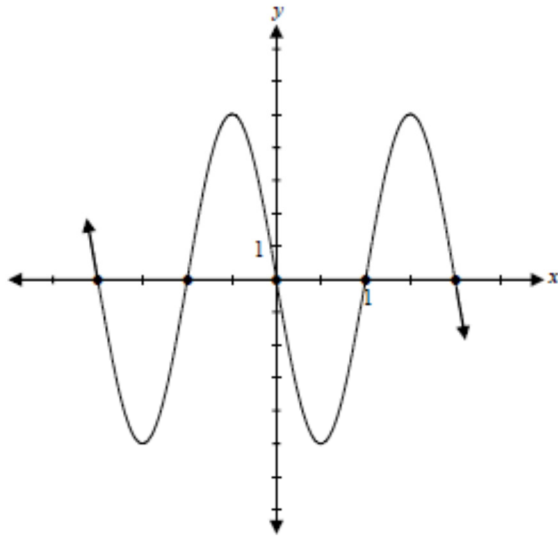
Sketch a graph of at least one period of the function $y = 5 \sin[\pi(x + 1)]$.

Clearly indicate the x -intercepts.

Solution

$$b = \pi$$

$$\therefore \text{period} = \frac{2\pi}{\pi} = 2$$



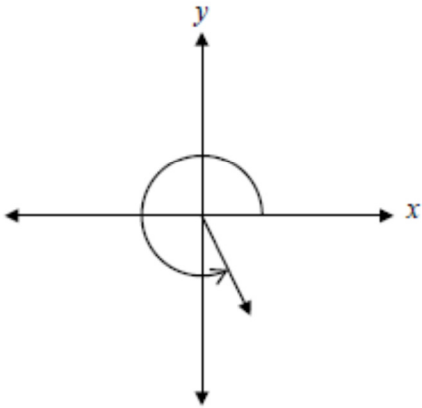
1 mark for amplitude
1 mark for horizontal shift
1 mark for period
1 mark for clearly indicating at least two x -intercepts consistent with graph

4 marks

Question 9

1 mark

Sketch the angle of 5 radians in standard position.

Solution

1 mark for angle drawn in Quadrant IV

1 mark

Question 37

3 marks

Evaluate:

$$\csc\left(\frac{11\pi}{6}\right) + \sin^2\left(-\frac{3\pi}{4}\right) + \cos\left(\frac{23\pi}{3}\right)$$

Solution

$$= (-2) + \left(-\frac{\sqrt{2}}{2}\right)^2 + \frac{1}{2}$$

$$= -2 + \frac{1}{2} + \frac{1}{2}$$

$$= -1$$

1 mark for $\csc\left(\frac{11\pi}{6}\right)$ (½ mark for quadrant, ½ mark for value)1 mark for $\sin^2\left(-\frac{3\pi}{4}\right)$ (½ mark for quadrant, ½ mark for value)1 mark for $\cos\left(\frac{23\pi}{3}\right)$ (½ mark for quadrant, ½ mark for value)

3 marks

June 2013

Question 14

1 mark

Angle θ , measuring $\frac{5\pi}{4}$, is drawn in standard position as shown below.

Determine the measures of all angles in the interval $[-4\pi, 2\pi]$ that are coterminal with θ .

Solution

$$\theta = -\frac{3\pi}{4} \quad \frac{1}{2} \text{ mark}$$

$$\theta = -\frac{11\pi}{4} \quad \frac{1}{2} \text{ mark}$$

1 mark

Question 1 (Calculator)**2 marks**

A central angle of a circle subtends an arc length of 5π cm.
Given the circle has a radius of 9 cm, find the measure of the central angle in degrees.

Solution

$$s = \theta r$$

$$5\pi = \theta(9)$$

$$\theta = \frac{5\pi}{9}$$

½ mark for substitution into correct formula

½ mark for solving for θ

$$\theta \text{ (in degrees)} = \frac{5\pi}{9} \cdot \frac{180^\circ}{\pi}$$

$$= 100^\circ$$

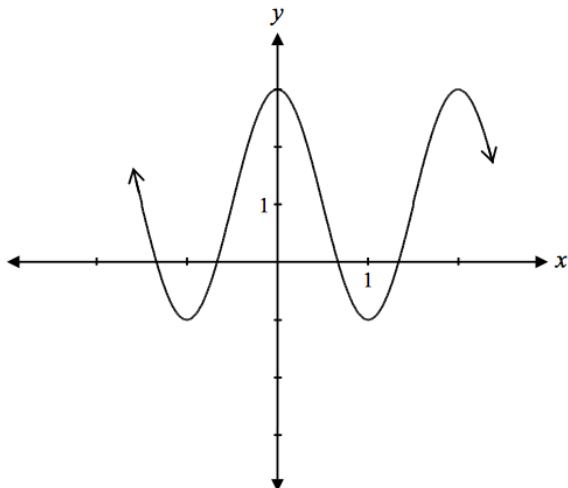
1 mark for conversion to degrees

2 marks

Question 25

1 mark

Given the graph of $y = 2 \cos \pi x + 1$ below, determine another equation that will produce the same graph.



$y =$ _____

Solution

Some sample equations are:

$$y = 2 \cos \pi(x - 2) + 1$$

1 mark for correct equation

$$y = -2 \cos \pi(x - 1) + 1$$

1 mark

$$y = -2 \cos \pi(x + 1) + 1$$

$$y = 2 \sin \pi \left(x + \frac{1}{2} \right) + 1$$

$$y = 2 \sin \pi \left(x - \frac{3}{2} \right) + 1$$

Other answers are possible.

Question 27

2 marks

Explain how to find the exact value of $\sec\left(\frac{19\pi}{6}\right)$.

Solution

Find the exact value of $\cos\left(\frac{19\pi}{6}\right)$.

1 mark for $\cos\left(\frac{19\pi}{6}\right)$

Then take the reciprocal of the value of $\cos\left(\frac{19\pi}{6}\right)$.

1 mark for reciprocal

2 marks

Question 32

2 marks

The terminal arm of an angle θ , in standard position, intersects the unit circle in Quadrant IV at a point $P\left(\frac{\sqrt{5}}{4}, y\right)$. Determine the value of $\sin \theta$.

Solution**Method 1**

The point $P(\theta)$ on the unit circle has coordinates $(\cos \theta, \sin \theta)$.

$$\cos^2 \theta + \sin^2 \theta = 1$$

½ mark for showing $y = \sin \theta$

$$\left(\frac{\sqrt{5}}{4}\right)^2 + \sin^2 \theta = 1$$

½ mark for substitution

$$\sin^2 \theta = 1 - \frac{5}{16}$$

$$\sqrt{\sin^2 \theta} = \sqrt{\frac{11}{16}}$$

$$\sin \theta = \pm \frac{\sqrt{11}}{4}$$

½ mark for solving for $\sin \theta$

$$\sin \theta = -\frac{\sqrt{11}}{4}$$

½ mark for a negative $\sin \theta$ value in Quadrant IV

2 marks

Method 2

$$(\sqrt{5})^2 + y^2 = 4^2$$

½ mark for substitution

$$5 + y^2 = 16$$

$$y^2 = 11$$

$$y = \pm \sqrt{11}$$

½ mark for solving for y

$$\sin \theta = -\frac{\sqrt{11}}{4}$$

½ mark for using the value of y to find the value of $\sin \theta$

½ mark for a negative $\sin \theta$ value in Quadrant IV

2 marks

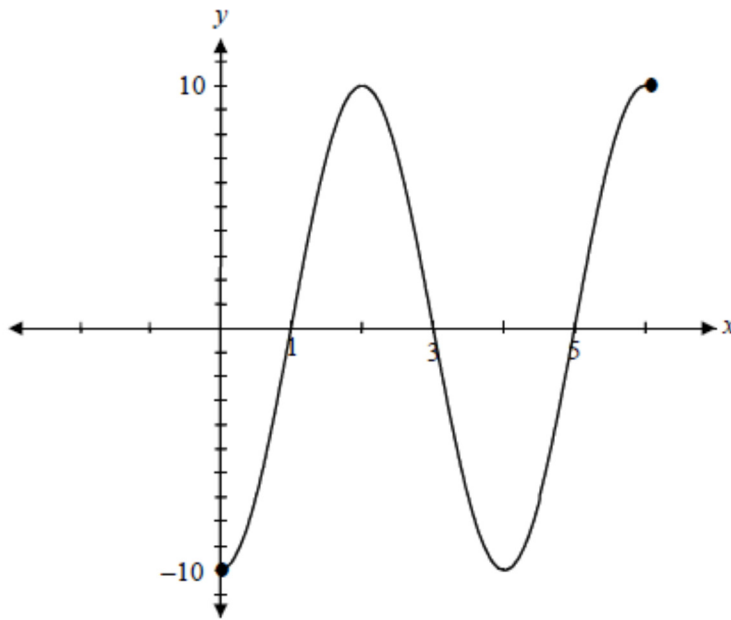
Question 42

3 marks

Sketch the graph of $y = 10 \cos\left[\frac{\pi}{2}(x - 2)\right]$ over the interval $[0, 6]$.

Solution

$$\text{period} = \frac{2\pi}{\frac{\pi}{2}} = 4$$



1 mark for amplitude
1 mark for period
1 mark for horizontal shift

3 marks