Question 18 (2008)

Let $f: \left[0, \frac{\pi}{2}\right] \to R$, $f(x) = \sin(4x) + 1$. The graph of f is transformed by a reflection in the x-axis followed by a dilation of factor 4 from the y-axis.

The resulting graph is defined by

A. $g: \left[0, \frac{\pi}{2}\right] \to R \qquad g(x) = -1 - 4\sin(4x)$

B. $g: [0, 2\pi] \to R \qquad g(x) = -1 - \sin(16x)$

C. $g: \left[0, \frac{\pi}{2}\right] \to R \qquad g(x) = 1 - \sin(x)$

D. $g: [0, 2\pi] \to R \qquad g(x) = 1 - \sin(4x)$

E. $g: [0, 2\pi] \to R \qquad g(x) = -1 - \sin(x)$

Question 1 (2010)

The function with rule $f(x) = 4\tan\left(\frac{x}{3}\right)$ has period

A. $\frac{\pi}{3}$

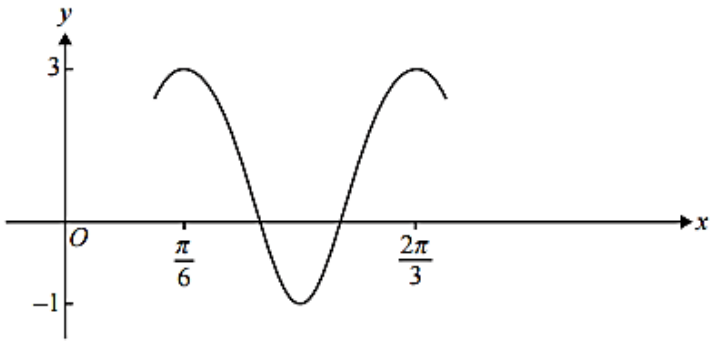
B. 6π

C. 3

D. 3π

E. $\frac{2\pi}{3}$

Question 15 (2011)



The graph shown could have equation

A. $y = 2\cos\left(x + \frac{\pi}{6}\right) + 1$

B. $y = 2\cos 4\left(x - \frac{\pi}{6}\right) + 1$

C. $y = 4\sin 2\left(x - \frac{\pi}{12}\right) - 1$

D. $y = 3\cos\left(2x + \frac{\pi}{6}\right) - 1$

E. $y = 2\sin\left(4x + \frac{2\pi}{3}\right) - 1$

Question 1 (2012)

The function with rule $f(x) = -3\sin\left(\frac{\pi x}{5}\right)$ has period

A. 3

B. 5

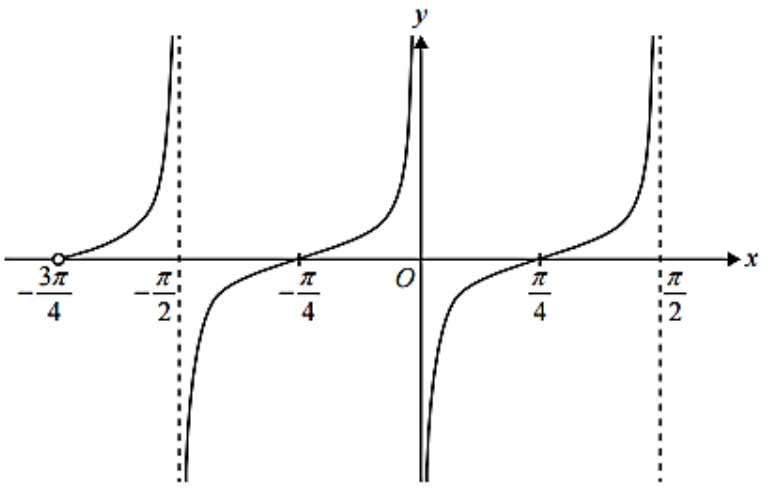
C. 10

D. $\frac{\pi}{5}$

E. $\frac{\pi}{10}$

Question 6 (2012)

A section of the graph of f is shown below.



The rule of f could be

A. $f(x) = \tan(x)$

B. $f(x) = \tan\left(x - \frac{\pi}{4}\right)$

C. $f(x) = \tan\left(2\left(x - \frac{\pi}{4}\right)\right)$

D. $f(x) = \tan\left(2\left(x - \frac{\pi}{2}\right)\right)$

E. $f(x) = \tan\left(\frac{1}{2}\left(x - \frac{\pi}{2}\right)\right)$

Question 7

The temperature, T °C, inside a building t hours after midnight is given by the function

$$f:[0, 24] \to R,\ T(t) = 22 - 10\cos\left(\frac{\pi}{12}(t-2)\right)$$

The average temperature inside the building between 2 am and 2 pm is

A. 10 °C

B. 12 °C

C. 20 °C

D. 22 °C

E. 32 °C

Question 1 (2013)

The function with rule $f(x) = -3\tan(2\pi x)$ has period

A. $\frac{2}{\pi}$

B. 2

C. $\frac{1}{2}$

D. $\frac{1}{4}$

E. 2π

Question 1 (12 marks) (2013)

Trigg the gardener is working in a temperature-controlled greenhouse. During a particular 24-hour time interval, the temperature (T °C) is given by $T(t) = 25 + 2\cos\left(\frac{\pi t}{8}\right)$, $0 \le t \le 24$, where t is the time in hours from the beginning of the 24-hour time interval.

a. State the maximum temperature in the greenhouse and the values of t when this occurs. 2 marks

b. State the period of the function T. 1 mark

Question 1 (7 marks)

The population of wombats in a particular location varies according to the rule $n(t) = 1200 + 400\cos\left(\frac{\pi t}{3}\right)$, where n is the number of wombats and t is the number of months after 1 March 2013.

a. Find the period and amplitude of the function n. 2 marks

b. Find the maximum and minimum populations of wombats in this location. 2 marks

c. Find $n(10)$. 1 mark

d. Over the 12 months from 1 March 2013, find the fraction of time when the population of wombats in this location was less than $n(10)$. 2 marks

Question 1 (2015)

Let $f: R \to R$, $f(x) = 2\sin(3x) - 3$.

The period and range of this function are respectively

A. period $= \frac{2\pi}{3}$ and range $= [-5, -1]$

B. period $= \frac{2\pi}{3}$ and range $= [-2, 2]$

C. period $= \frac{\pi}{3}$ and range $= [-1, 5]$

D. period $= 3\pi$ and range $= [-1, 5]$

E. period $= 3\pi$ and range $= [-2, 2]$

Question 2 (2016)

Let $f: R \to R$, $f(x) = 1 - 2\cos\left(\frac{\pi x}{2}\right)$.

The period and range of this function are respectively

A. 4 and $[-2, 2]$

B. 4 and $[-1, 3]$

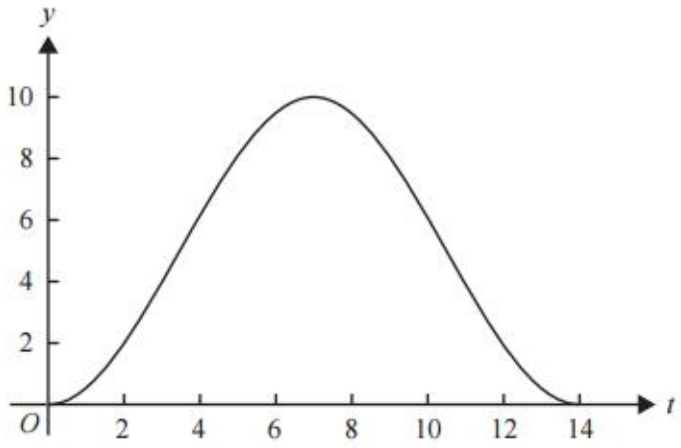
C. 1 and $[-1, 3]$

D. 4π and $[-1, 3]$

E. 4π and $[-2, 2]$

Question 8

The UV index, y, for a summer day in Melbourne is illustrated in the graph below, where t is the number of hours after 6 am.



The graph is most likely to be the graph of

A. $y = 5 + 5\cos\left(\frac{\pi t}{7}\right)$

B. $y = 5 - 5\cos\left(\frac{\pi t}{7}\right)$

C. $y = 5 + 5\cos\left(\frac{\pi t}{14}\right)$

D. $y = 5 - 5\cos\left(\frac{\pi t}{14}\right)$

E. $y = 5 + 5\sin\left(\frac{\pi t}{14}\right)$

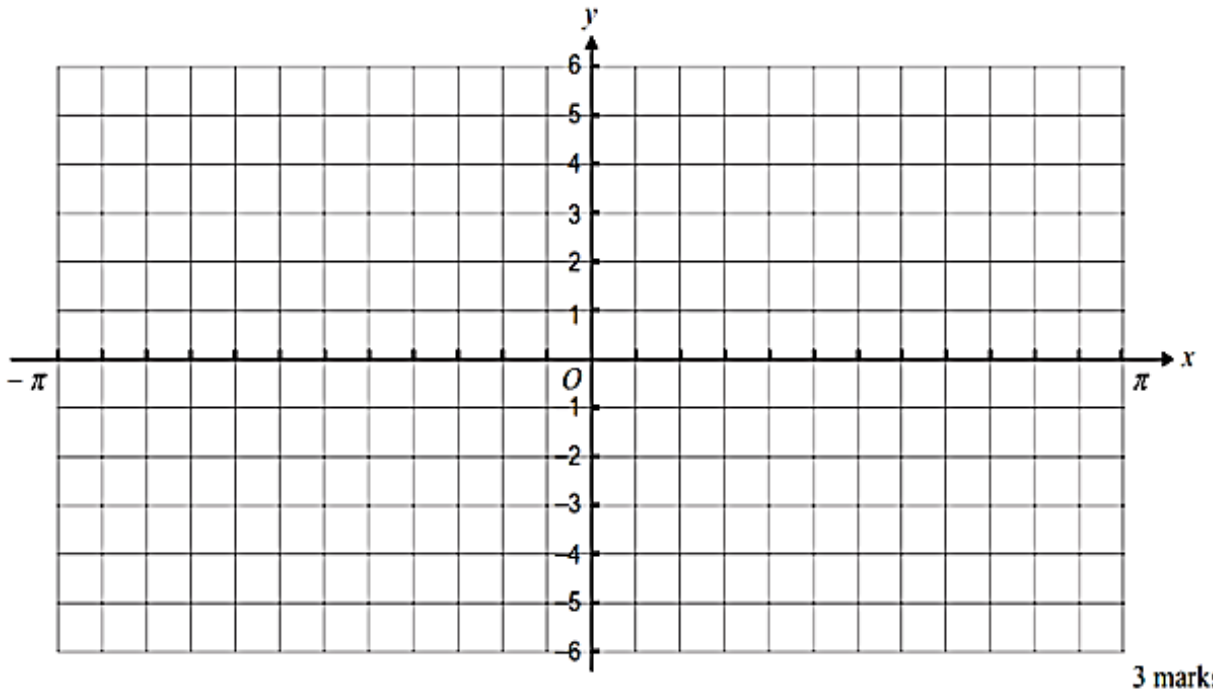
Question

Consider the function: $g(x) = 5\cos\left(2\left(x - \frac{\pi}{6}\right)\right) - 1$

Write down the range of this function.

2 marks

b. sketch the graph of the function f on the set of axes below. Label axes intercepts with their coordinates. Label endpoints of the graph with their coordinates.



3 marks

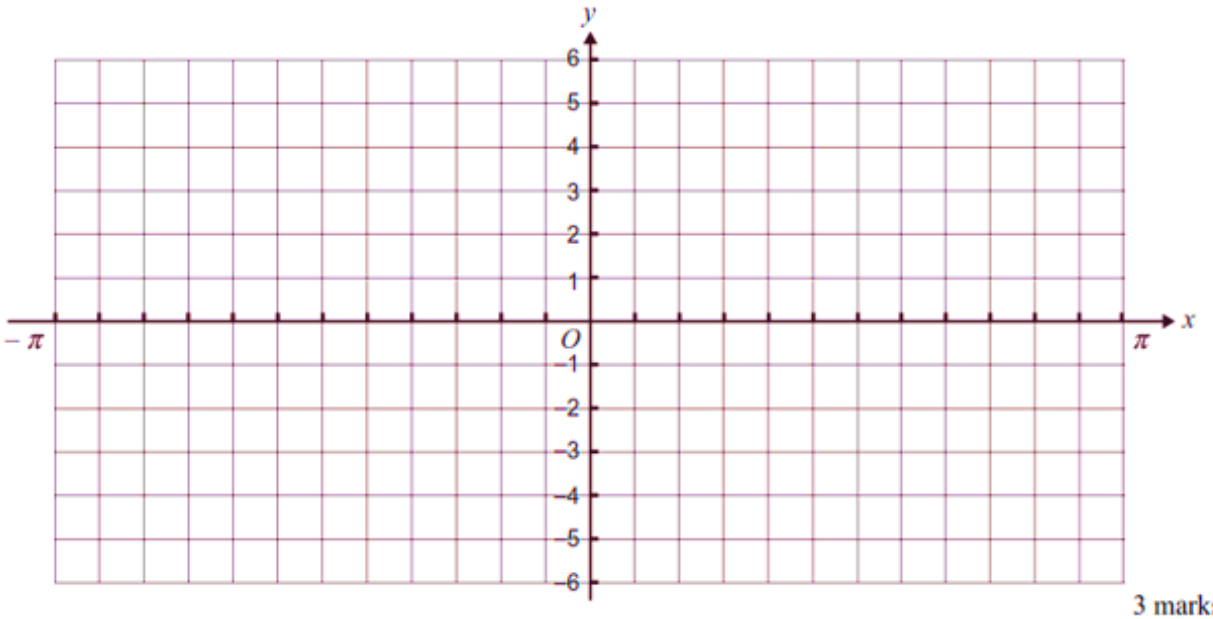
Question

For the function $f:[-\pi, \pi] \to R,\ f(x) = 5\cos\left(2\left(x+\frac{\pi}{3}\right)\right)$

a. write down the amplitude and period of the function

2 marks

b. sketch the graph of the function f on the set of axes below. Label axes intercepts with their coordinates. Label endpoints of the graph with their coordinates.



3 marks

Question The height of the water in a bay varies sinusoidally over time. On a certain day off the coast of Maine, a high tide of 10 feet occurred at 5:00 A.M. and a low tide of 2 feet occurred at 1:00 P.M. Write a model for the height h (in feet) of the water as a function of time t (in hours since midnight).