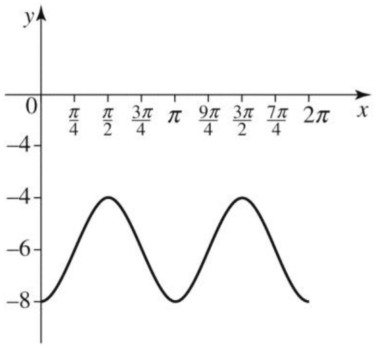
Revision for SAC2-2014

Q1



The figure above shows a graph of the form $y = a\sin n(x-\varepsilon)+c$. The values of a, n, ε and c respectively are:

A $-2, 4, 0.25\pi, -6$
B $2, 4, 0.5\pi, -6$
C $-2, 2, 0.25\pi, -6$
D $2, 2, 0.25\pi, -6$
E $-2, 2, 0.5\pi, -6$

Q2

If an equation is in the form $y = a\cos n(x-\varepsilon)+c$ and the amplitude is 2, the period is 3π, there is an downward shift of 1 and a shift to the left of $\frac{\pi}{6}$, then the actual equation is:

A $y = 2\cos\frac{2}{3}(x+\frac{\pi}{6})-1$

B $y = 2\cos\frac{3}{2}(x-\frac{\pi}{6})-1$

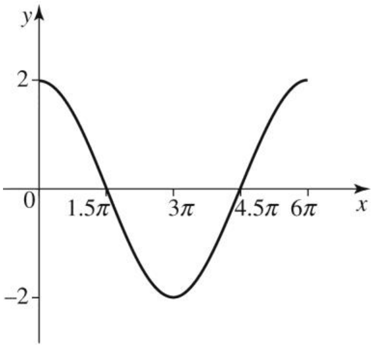
C $y = 2\cos(\frac{2}{3}x+\frac{\pi}{6})-1$

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

E $y = 2\cos\frac{2}{3}(x+\frac{\pi}{4})-1$

Q3

1



The figure above shows a graph of the form $y = a\cos nx$. The values of *a* and *n* respectively are:

A 2 and 3π

B 2 and $\frac{\pi}{3}$

C 2 and 3

D 2 and $\frac{2}{3}$

E 2 and $\frac{1}{3}$

Q4

If $f(x) = \cos x$ and $g(x) = x^2$ then $f(g(\frac{\pi}{3}))$ is equal to:

A $\cos\left(\frac{\pi^2}{9}\right)$ **B** $\frac{1}{\sqrt{2}}$ **C** $\frac{1}{4}$ **D** $\frac{3}{4}$ **E** $\frac{4}{3}$

Q5

The range of the function $f: R \to R$, $f(x) = 2\,|\sin x| + 3$ is:

A [0, 3] **B** [−1, 5] **C** [−1, 3] **D** [3, 5] **E** [0, 5]

Q6

The rule for the inverse of the function with rule $f(x) = 10^{ax} + b$ is given by:

A $f^{-1}(x) = \frac{1}{10^{ax} + b}$

B $f^{-1}(x) = 10^{-ax} - b$

C $f^{-1}(x) = a\log_{10}(x - b)$

D $f^{-1}(x) = \frac{1}{a}\log_{10}(x + b)$

E $f^{-1}(x) = \frac{1}{a}\log_{10}(x - b)$

Q7

Solve each of the following the equations for x:

a $2^{2x} - 6\times2^{x} + 8 = 0$ for x

b $5^{2x} - 6 \times 5^{x} + 9 = 0$

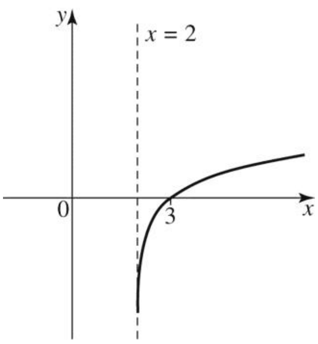
c $\log_{10}(x) + 2\log_{10}(5) = \log_{10}(6)$

d $\log_{3}(x - a) = b$

e $2\log_{3}(x) + \log_{3}(a) = 0$

f $2\log_{e}(x) + \log_{e}(a) = 0$

Q8



The graph above represents the inverse of:

A $y = e^{x} - 2$
B $y = e^{x} + 2$
C $y = e^{(x + 2)}$
D $y = 2 - e^{x}$
E $y = e^{(x - 2)}$

Q9

F Solve the equation $\log_{10}(10 + 5x) - \log_{10}(10 - 2x) = 1$ for x.

Q10

a. For the functions f and g, $f: R \to R$, $f(x) = e^{x}$ and $g:[0, 2] \to R$, $g(x) = 2x$, state the rule, maximal domain and corresponding range of the following functions:

b. **a** $f(g(x))$

c. **b** $(f + g)(x)$

d. **c** $(fg)(x)$

Q11

On the same set of axes, sketch the graphs of $y = 3\cos 4x$ and $y = 2\sin 4x$ between $x = -\pi$ and $x = \pi$. Find the points of intersection.

Q12

For the pair of functions $f(x) = -2\cos(x) + 1$ and $g(x) = e^{\frac{1}{4}x}$:

(a) show that $f(g(x))$ is defined

(b) find $f(g(x))$ and state its domain

Q13

The temperature T °C inside a house at time t hours after 6.00 am is given by

$T = 18 - 4\cos\frac{\pi t}{12}$ for $0 \le t \le 24$.

The temperature θ °C outside a house at time t hours after midnight is given by

$\theta = 11 - 6\cos\frac{\pi t}{12}$ for $0 \le t \le 24$.

If the difference between the inside and outside temperatures can be represented by $D = T - \theta$, sketch the graph of *D.*

Determine when the difference between the inside and the outside temperature is less than 6°C.

Q14

For f: $(0, \infty) \to R$, $f(x) = \log_e(2x)$ and g: $R \to R$, $g(x) = e^{x+1}$:

a find $f(g(x))$ and $g(f(x))$ and express each in the form $mx + c$ where m and c are constants

b sketch the graph of $y = f(g(x))$ and $y = g(f(x))$

c find $g^{-1}(x)$