Higher Mathematics
Multiple Choice 3

1. A curve has equation $y = x^4 - 3x^2$. The gradient of the tangent to this curve at the point (-1,-2) is

A -3 B 2 C -10 D 3

2. Given $\sin x = \frac{1}{2}$, $0 \le x \le 360$, the exact value of $\sin 2x$ is

A $\frac{1}{2}$ B $\frac{\sqrt{5}}{2}$ C $\frac{\sqrt{3}}{2}$ D 1

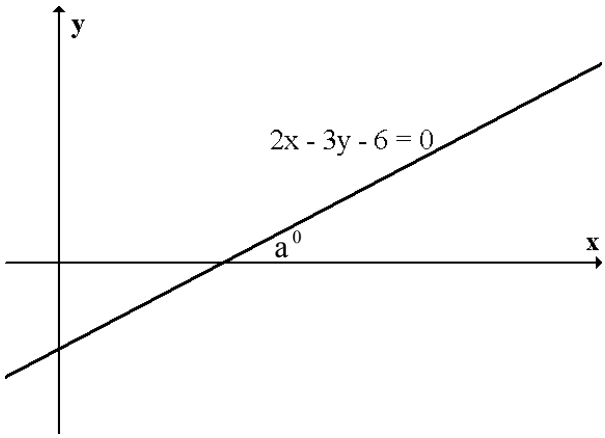
3. The derivative of $\dfrac{1}{6x^3}$ is

A $-\dfrac{18}{x^4}$ B $-\dfrac{18}{x^2}$ C $-\dfrac{1}{2x^2}$ D $-\dfrac{1}{2x^4}$

4. The line with equation $y = 3x$ is a tangent to the circle with equation $x^2 + y^2 = 40$. The x-coordinates of the points of intersection are

A $x = -2, 2$ B $x = -1, 1$ C $x = -\sqrt{10}, \sqrt{10}$ D $-10, 10$

5. The diagram shows the line $2x - 3y - 6 = 0$. Tan a^0 is equal to



A $\frac{2}{3}$ B $\frac{3}{2}$

C $-\frac{2}{3}$ D $-\frac{3}{2}$

6. How many solutions does the equation $(3\cos x + 1)(\cos x - 1) = 0$ have in the interval $0 \le x \le \pi$.

A 1 B 2 C 3 D 4

7. The range of values of $f(x) = 9 - 2\cos\left(3x - \frac{2\pi}{3}\right)$ is

A $7 \le f(x) \le 11$ B $-11 \le f(x) \le -7$ C $5 \le f(x) \le 9$ D $-9 \le f(x) \le -7$

8. The vector **a** has components $\begin{pmatrix} -1 \\ 2 \\ 2 \end{pmatrix}$. A unit vector parallel to **a** is

A $-9\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}$ B $-\frac{1}{9}\mathbf{i} + \frac{2}{9}\mathbf{j} + \frac{2}{9}\mathbf{k}$ C $-\frac{1}{3}\mathbf{i} + \frac{2}{3}\mathbf{j} + \frac{2}{3}\mathbf{k}$ D $3\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}$

9. Given f(x) is defined on a suitable domain as $f(x) = 4\left(2 - 2x^3\right)^{-\frac{1}{2}}$, $f'(x)$ is equal to

A $-2\left(2 - 2x^3\right)^{-\frac{3}{2}}$ B $4\left(2 - 2x^3\right)^{-\frac{3}{2}}$ C $-4\left(2 - 2x^3\right)^{-\frac{3}{2}}$ D $12x^2\left(2 - 2x^3\right)^{-\frac{3}{2}}$

10. The values of x for which $15 + 2x - x^2 > 0$ are

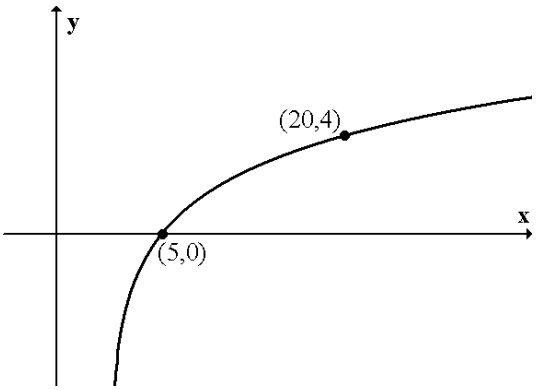
A $-3 < x < 5$ B $-5 < x < 3$ C $x < -3, x > 5$ D $x < -5, x > 3$

11. $4\sin(x - 36.5)^0$ has a minimum value in the range $0 \le x \le 360$ when x is equal to

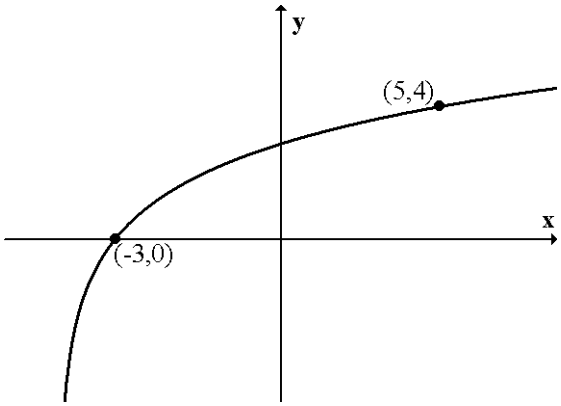
A 306.5^0 B 233.5^0 C 216.5^0 D 143.5^0

12. Which of the following graphs has equation $y = \log_2(x - 4)$.

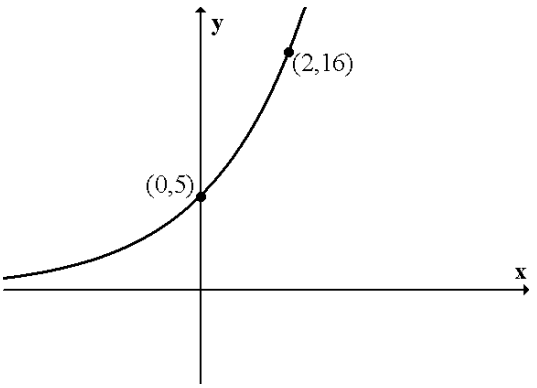
A



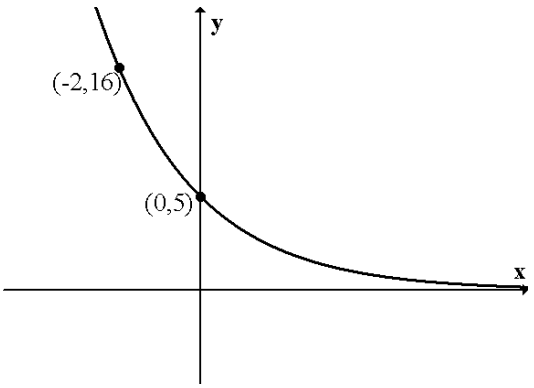
B



C



D



13. Two vectors are $\mathbf{u} = 2\mathbf{i} - 4\mathbf{j} + a\mathbf{k}$ and $\mathbf{v} = 10\mathbf{i} - 4\mathbf{k}$. The vectors **u** and **v** are perpendicular. The value of a is

A -5 B 5 C 4 D 3

14. k and a are given by

$k \sin a = 2$

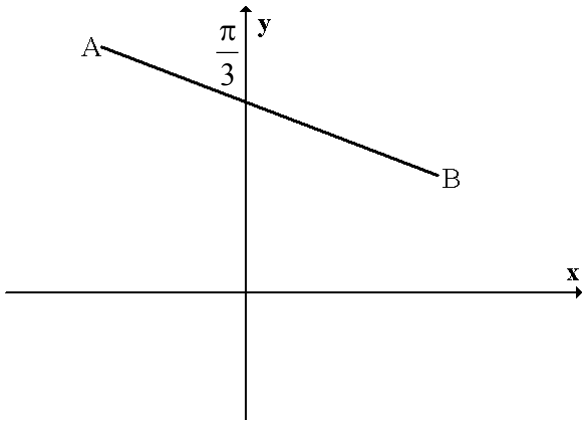
$k \cos a = 2$

where $k > 0$ and $0 \le a \le 90$. The values of k and a are

A $k = 8, a = 30^0$ B $k = 8, a = 45^0$ C $k = \sqrt{8}, a = 30^0$ D $k = \sqrt{8}, a = 45^0$

15. The line AB makes an angle of $\frac{\pi}{3}$ with the y-axis, as shown.

The gradient of AB is

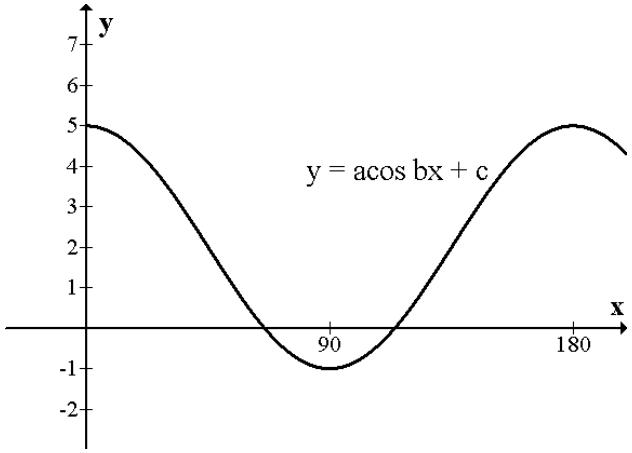


A $\sqrt{3}$ B $-\sqrt{3}$

C $-\frac{1}{\sqrt{3}}$ D $\frac{1}{\sqrt{3}}$

16. The graph opposite is of the form $y = a\cos bx + c$.

The values of a and c are



A $a = 3, c = -2$ B $a = 2, c = 3$

C $a = 3, c = 2$ D $a = 2, c = -3$

17. $2x^2 + 12x - 1$ is expressed in the form $a(x + b)^2 + c$. The value of c is

A -8 B -10 C -19 D -17

18. $f(x) = x^3 - 5$ and $g(x) = 3x + 2$. The value of $f(g(-1))$ is

A -10 B -6 C -4 D -16

19. $f(x) = \sqrt{25 - x^2}$. A suitable domain for f(x) is

A $-5 < x < 5$ B $x > 5$ C $-25 < x < 25$ D $x > -5$

20. $\int 8\sin(4x + \frac{\pi}{2})\,dx$ is

A $8\cos(4x + \frac{\pi}{2}) + C$ B $-8\cos(4x + \frac{\pi}{2}) + C$ C $-2\cos(4x + \frac{\pi}{2}) + C$ D $2\cos(4x + \frac{\pi}{2}) + C$

1.	B		11.	A
2.	C		12.	A
3.	D		13.	B
4.	A		14.	D
5.	A		15.	C
6.	B		16.	C
7.	A		17.	C
8.	C		18.	B
9.	D		19.	A
10.	A		20.	C