

SECTION A

ALL questions should be attempted.

1. Here are two statements about the line with equation $3x - 4y + 2 = 0$.

(1) The y-intercept is $(0, 2)$.

(2) The gradient is $\frac{3}{4}$.

Which of the following is true?

- A Neither statement is correct.
- B Only statement (1) is correct.
- C Only statement (2) is correct.
- D Both statements are correct.

2. Functions f and g are defined on suitable domains by

$$f(x) = 2x + 1 \text{ and } g(x) = 3 - x.$$

Find an expression for $g(f(x))$.

- A $x + 4$
- B $2 - 2x$
- C $3 + 5x - 2x^2$
- D $2x^2 + 7x + 3$

3. A circle has equation $x^2 + y^2 - 4x + 10y - 1 = 0$.

What is the radius of this circle?

- A $\sqrt{5}$ units
- B $\sqrt{13}$ units
- C $\sqrt{30}$ units
- D $\sqrt{115}$ units

4. What is the derivative of $\frac{4x^3 - 3}{2x}$, $x \neq 0$, with respect to x ?
- A $6x$
- B $x^2 - 3x^{-1}$
- C $16x - 6x^{-2}$
- D $4x + \frac{3}{2}x^{-2}$
5. Find $\int \frac{1}{5x^2} dx$, $x \neq 0$.
- A $-\frac{1}{5x} + c$
- B $\frac{1}{10x} + c$
- C $-\frac{5}{x^3} + c$
- D $\frac{5}{3x^3} + c$
6. A sequence is generated by the recurrence relation $u_{n+1} = 2u_n - 3$.
- Given that $u_2 = 7$, what is the value of u_0 ?
- A -7
- B -3
- C 0
- D 4
7. What is the exact value of $\tan \frac{5\pi}{3}$?
- A $-\sqrt{3}$
- B $-\frac{\sqrt{3}}{2}$
- C -1
- D $-\frac{1}{\sqrt{3}}$

8. A circle with centre $(2, -3)$ passes through the point $(1, 4)$.

What is the equation of the circle?

A $(x-2)^2 + (y+3)^2 = 10$

B $(x-2)^2 + (y+3)^2 = 50$

C $(x+2)^2 + (y-3)^2 = 10$

D $(x+2)^2 + (y-3)^2 = 50$

9. For what value of k does the equation $x^2 + 2x + k = 0$ have equal roots?

A -1

B 0

C 1

D 2

10. $f(x) = x^3 + x^2 - 3x + 2$.

What is the remainder when $f(x)$ is divided by $(x-2)$?

A 0

B 2

C 4

D 8

11. What is the maximum value of $7 - 5\sin\left(x + \frac{3\pi}{4}\right)$?

A 1

B 2

C 7

D 12

12. The line through the points $(-1, -7)$ and $(k, 5)$ has gradient 4.

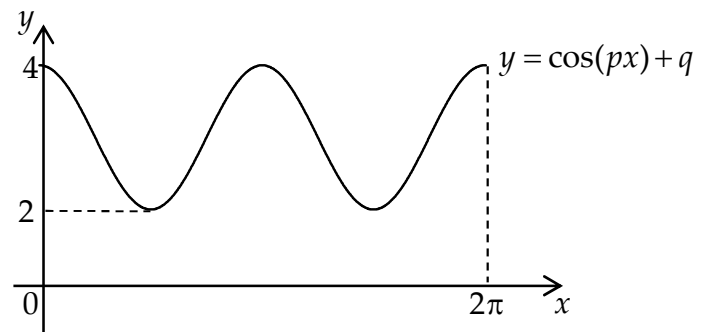
What is the value of k ?

- A -7
- B -5
- C 2
- D 5

13. The graph shown in the diagram has equation of the form $y = \cos(px) + q$.

What are the values of p and q ?

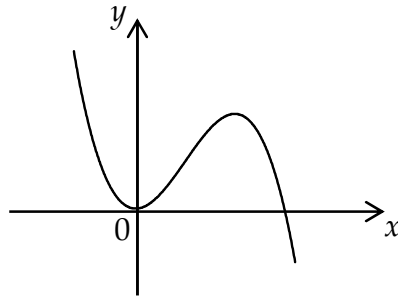
	p	q
A	1	3
B	2	3
C	1	4
D	2	4



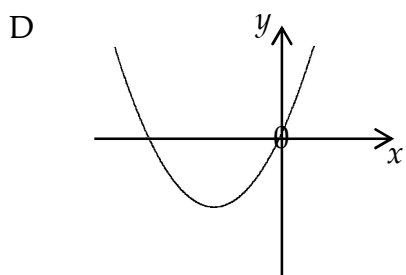
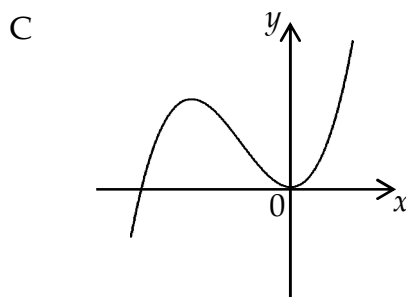
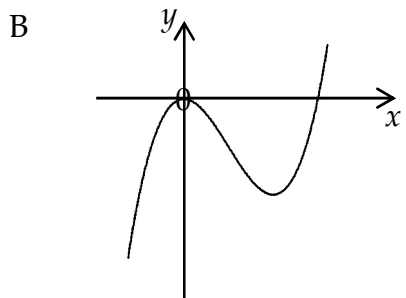
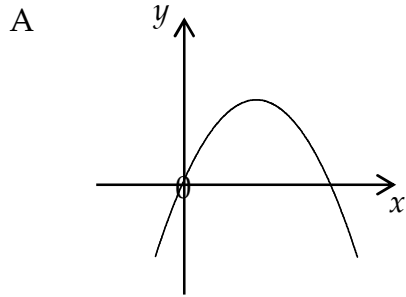
14. Given that $g(x) = \frac{1}{x^2 - 9}$, what is the largest possible domain for $g(x)$?

- A \mathbb{R} , the set of real numbers.
- B $\mathbb{R} - \{0\}$
- C $\mathbb{R} - \{-3, 3\}$
- D $\mathbb{R} - \{-9, 9\}$

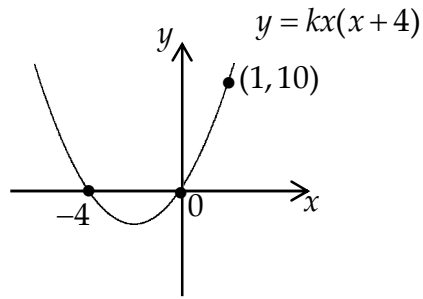
15. The diagram shows the graph of $y = f(x)$.



Which diagram below shows the graph of $y = f'(x)$?



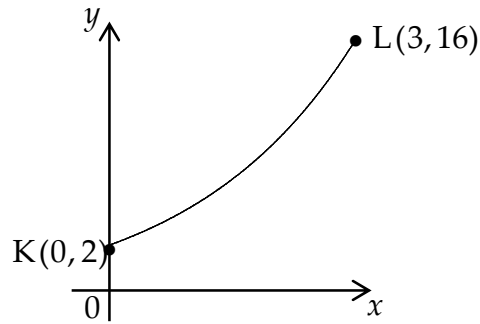
16. The equation of the parabola shown is of the form $y = kx(x + 4)$.



What is the value of k ?

- A 0
B 1
C 2
D 4
17. If $3x^2 - 12x + 5$ is expressed in the form $3(x - p)^2 + q$, what is the value of q ?
- A -7
B -4
C 2
D 5
18. What is the solution to $x^2 + 5x + 6 < 0$?
- A $-3 < x < -2$
B $x < -6$ or $x > -1$
C $x < 1$ or $x > 6$
D $2 < x < 3$
19. If $v = 2t^3$ and the rate of change of v with respect to t at $t = k$, $k > 0$ is 600, find the value of k .
- A 0
B 2
C $\sqrt[3]{300}$
D 10

20. The diagram shows the curve whose graph is $y = f(x)$.



The curve passes through the points K(0, 2) and L(3, 16).

Which of the following represents the equation of the curve?

A $y = x^2 + 2$

B $y = 2^{x+1}$

C $y = e^{x+2}$

D $y = 2^x + 9$

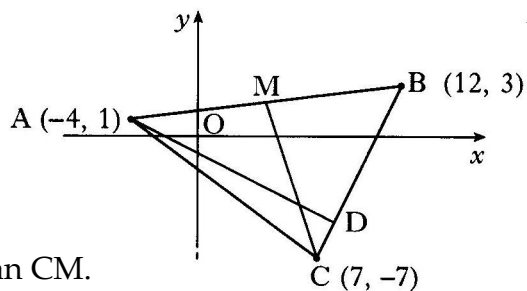
End of Section A

SECTION B

ALL questions should be attempted.

Marks

21. A triangle ABC has vertices
A(-4, 1), B(12, 3) and C(7, -7).



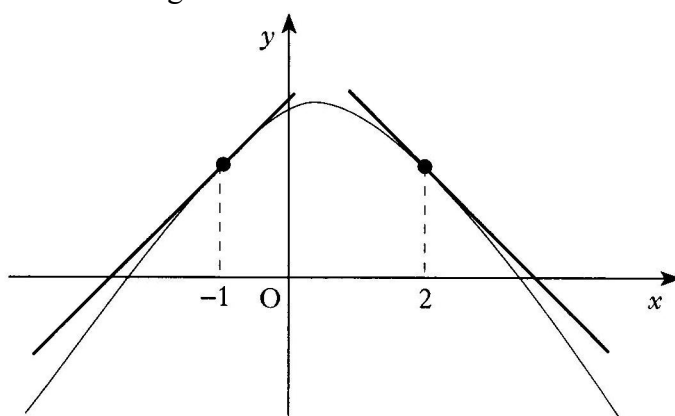
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|-----|---|---|
| (a) | Find the equation of the median CM. | 3 |
| (b) | Find the equation of the altitude AD. | 3 |
| (c) | Find the coordinates of the point of intersection of CM and AD. | 2 |

22. A function f is defined by the formula $f(x) = (x-1)^2(x+2)$ where $x \in \mathbb{R}$.

- | | | |
|-----|--|---|
| (a) | Find the coordinates of the points where the curve with equation $y = f(x)$ crosses the x - and y -axes. | 3 |
| (b) | Find the stationary points of the curve $y = f(x)$ and determine their nature. | 7 |
| (c) | Sketch the curve $y = f(x)$. | 2 |

23. Solve the equation $\sin 2x^\circ + \sin x^\circ = 0$ for $0 \leq x < 360$. 5

24. The parabola $y = ax^2 + bx + c$ crosses the y -axis at (0, 3) and has two tangents drawn, as shown in the diagram



The tangent at $x = -1$ makes an angle of 45° with the positive direction of the x -axis and the tangent at $x = 2$ makes an angle of 135° with the positive direction of the x -axis.

Find the values of a , b and c .

5

End of Section B

End of question paper