

### Section A

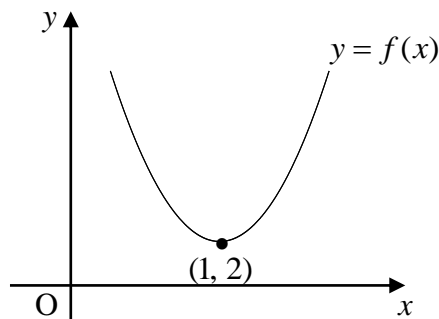
All questions should be attempted

1. A sequence is defined by the recurrence relation  $u_{n+1} = 0.75u_n + 10$ , with  $u_0 = 8$ .

What is the value of  $u_2$ ?

- A  $10.75$
- B  $16$
- C  $19$
- D  $22$

2. The diagram shows the graph of a quadratic function  $f$ , with a turning point at  $(1, 2)$ .



The function  $g$  is given by  $g(x) = f(x) - 5$ , where  $x$  is a real number.

What is the range of  $g(x)$ ?

- A  $g(x) \geq -4$
- B  $g(x) \geq -3$
- C  $g(x) \geq 2$
- D  $g(x) \geq 7$

3. If  $f(x) = 2x^{-3} - 3x^{\frac{1}{2}}$ ,  $x > 0$ , find  $f'(x)$ .

- A  $-6x^{-4} - 2x^{\frac{3}{2}}$
- B  $-6x^{-4} - \frac{3}{2}x^{-\frac{1}{2}}$
- C  $-6x^{-2} - 2x^{\frac{3}{2}}$
- D  $-6x^{-2} - \frac{3}{2}x^{-\frac{1}{2}}$

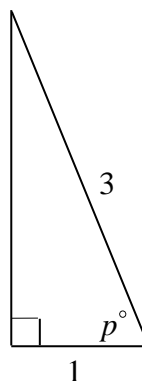
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4. The functions  $f$  and  $g$  are defined on the set of real numbers by  $f(x) = 1 - 2x$  and  $g(x) = x^2$   
What is the value of  $f(g(-2))$ ?

- A  $-9$
- B  $-7$
- C  $9$
- D  $20$

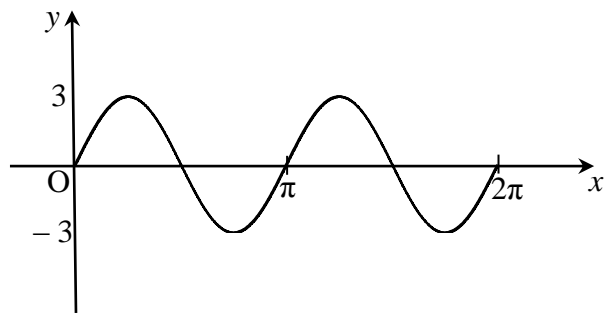
5. Given the right angled triangle shown in the diagram, what is the value of  $\cos 2p^\circ$ ?

- A  $-\frac{7}{9}$
- B  $-\frac{1}{3}$
- C  $\frac{1}{3}$
- D  $\frac{2}{3}$

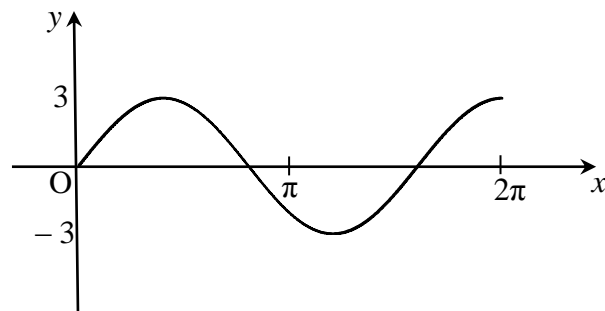


6. Which of the following diagrams shows the graph of  $y = 3\sin 2x$ , for  $0 \leq x \leq 2\pi$ ?

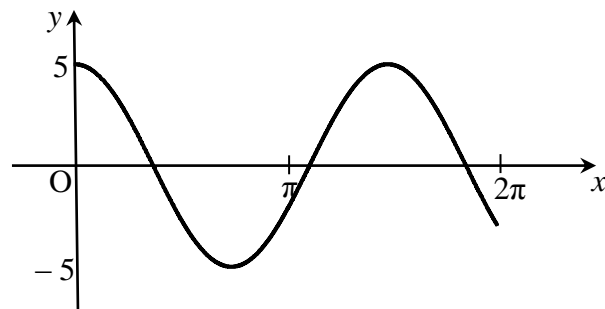
A



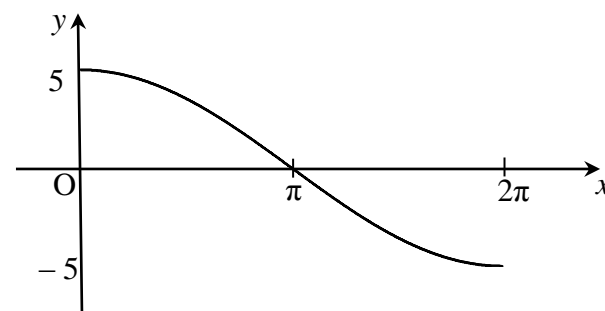
B



C



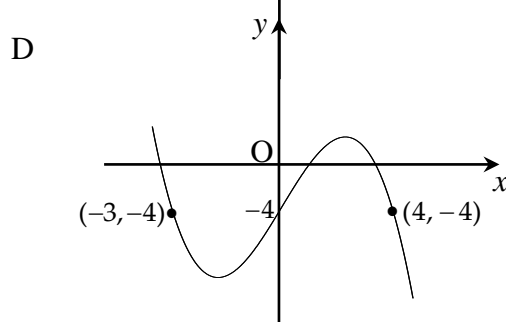
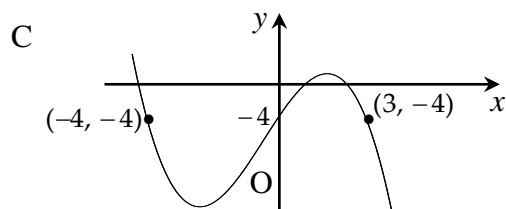
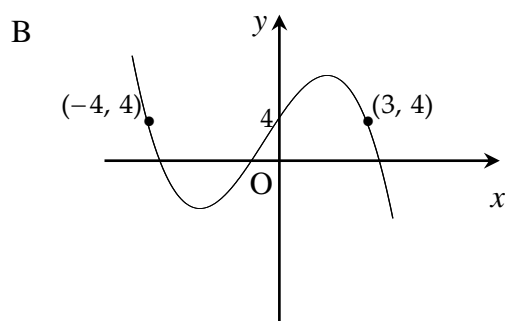
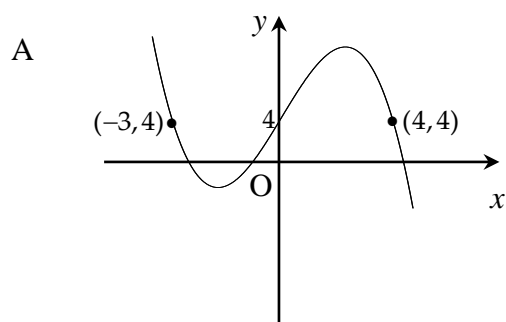
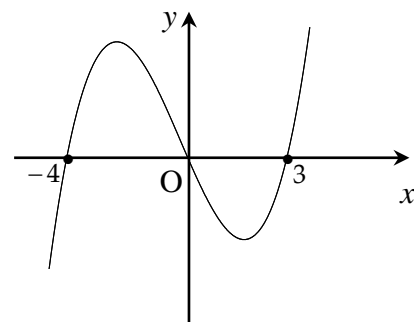
D



Turn over.

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

Which of the following shows the graph of  $y = 4 - f(x)$ ?



Turn over.

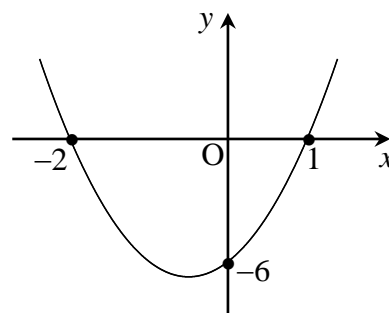
8. If  $x^2 - 4x + 7$  is written in the form  $(x + p)^2 + q$ , what is the value of  $q$ ?

- A 3
- B 5
- C 7
- D 11

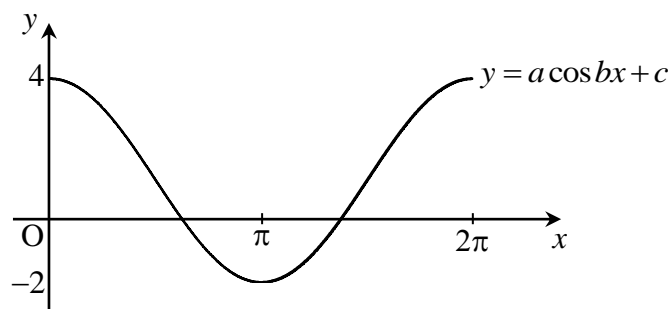
9. The diagram shows the graph of a quadratic.

What is the equation of this parabola?

- A  $y = -(x + 2)(x - 1)$
- B  $y = -3(x - 2)(x + 1)$
- C  $y = (x - 2)(x + 1)$
- D  $y = 3(x + 2)(x - 1)$



10. The graph with equation of the form  $y = a \cos bx + c$  is shown for  $0 \leq x \leq 2\pi$ .



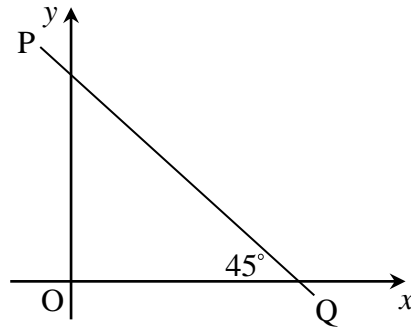
What is the equation of this graph?

- A  $y = \cos x + 3$
- B  $y = \cos 3x + 1$
- C  $y = 3 \cos x + 1$
- D  $y = 4 \cos x + 2$

11. The diagram shows the line PQ inclined at an angle of  $45^\circ$  to the  $x$ -axis.

What is the gradient of PQ?

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



12. What is the maximum value of  $2 - 3\sin\left(x + \frac{\pi}{4}\right)$ ?

- A  $-1$   
B  $1$   
C  $2$   
D  $5$

13. Here are two statements about the roots of the quadratic equation  $3x^2 + x - 2 = 0$ :

- (1) The equation has equal roots.  
(2) The equation has rational roots.

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.

14. If  $f(x) = x\sqrt{x}$ , where  $x > 0$ , find  $f'(x)$ .

- A  $1 + \frac{1}{2\sqrt{x}}$   
B  $\sqrt{x}$   
C  $\frac{3}{2}\sqrt{x}$   
D  $\frac{2}{5}x^{\frac{5}{2}}$

Turn over.

15. What is the value of  $\cos \frac{11\pi}{6} + \sin \frac{7\pi}{6}$ ?

A  $\frac{\sqrt{3}-1}{2}$

B  $-\frac{\sqrt{3}-1}{2}$

C  $\frac{\sqrt{3}+1}{2}$

D  $-\frac{\sqrt{3}+1}{2}$

16. A ball is projected from the ground. The height,  $h$  metres, above the ground after  $t$  seconds is given by  $h(t) = 10t - t^2$ .

What is the rate of change of  $h$  after 3 seconds?

A 4

B 5

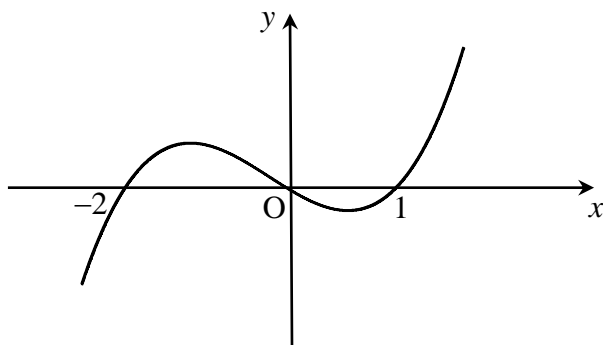
C 21

D 36

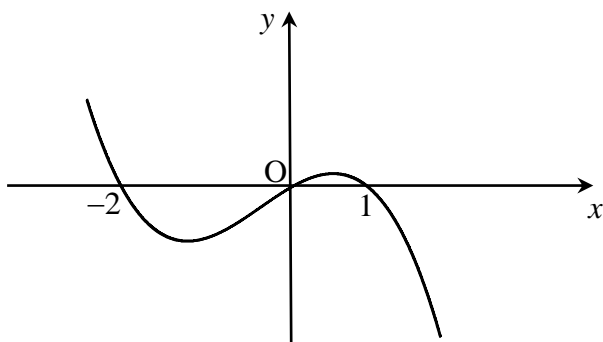
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17. Which of the following is the graph of  $y = x(x-1)(x+2)$ ?

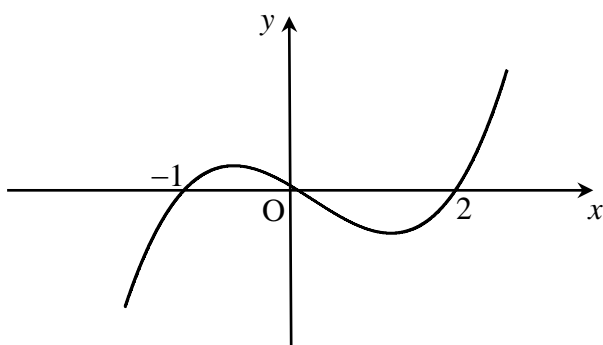
A



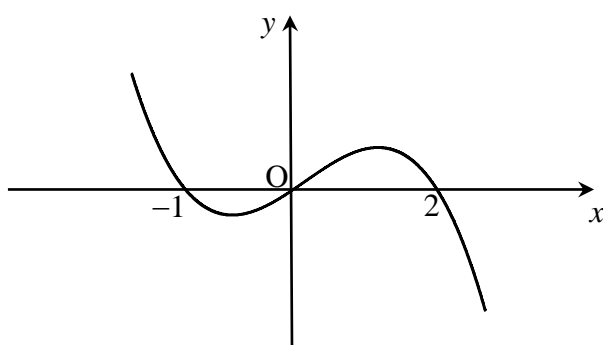
B



C



D



18. For what values of  $x$  is  $(x+5)(x-1) < 0$ ?

A  $x < -5, x < 1$

B  $-5 < x < 1$

C  $x < -1, x < 5$

D  $-1 < x < 5$

Turn over.



19. What is the maximum value of  $\frac{3}{3 - \cos 2x}$ ?

A  $\frac{3}{4}$

B 1

C  $\frac{3}{2}$

D 3

20. A strictly increasing function  $f$  is such that  $f'(x) = (x-3)(x+2)$ .

What are the possible values of  $x$ ?

A  $x = -2, x = 3$

B  $x \leq -2, x \geq 3$

C  $-2 < x < 3$

D  $x < -2, x > 3$

Turn over.