

# ALGEBRA

December 14, 2023

1. The value(s) of  $k$  for which the quadratic equation  $2x^2 + kx + 2 = 0$  has equal roots, is
  - (A) 4
  - (B)  $\pm 4$
  - (C)  $-4$
  - (D) 0
2. on dividing a polynomial  $p(x)$  by  $x^2 - 4$ , quotient and remainder are found to be  $x$  and 3 respectively. The polynomial  $p(x)$  is
  - (A)  $3x^2 + x - 12$
  - (B)  $x^3 - 4x + 3$
  - (C)  $x^2 + 3x - 4$
  - (D)  $x^3 - 4x - 3$
3. Simplest form of

$$\frac{1 + \tan^2 A}{1 + \cot^2 A} \tag{1}$$

is .

4. Write the value of

$$\sin^2 30^\circ + \cos^2 60^\circ \tag{2}$$

.

5. From the quadratic polynomial, the sum and product of whose zeroes are  $(-3)$  and  $2$  respectively.
6. Can  $(x^2 - 1)$  be a remainder while dividing  $x^4 - 3x^2 + 5x - 9$  by  $(x^2 + 3)$  ? Justify your answer with reasons.
7. If  $A$ ,  $B$  and  $C$  are interior angles of  $\triangle ABC$ , then show that

$$\cos\left(\frac{B+C}{2}\right) = \sin\left(\frac{A}{2}\right) \quad (3)$$

8. Prove that :

$$(\sin^4 \theta - \cos^4 \theta + 1) \operatorname{cosec}^2 \theta = 2 \quad (4)$$

9. Sum of the areas of two squares is  $544m^2$ . If the difference of their perimeters is  $32m$ , find the sides of the two squares.
10. A motor boat whose speed is  $18\text{km/h}$  in still water takes  $1$  hour more to go  $24\text{km}$  upstream than to return down stream to the same spot. Find the speed of the stream.
11. Obtain the zeroes of the polynomial  $p(x) = 2x^4 - x^3 - 11x^2 + 5x + 5$  if two zeroes are  $\sqrt{5}$  and  $-\sqrt{5}$ .
12. What minimum is added to  $2x^3 - 3x^2 + 6x + 7$  so that the resulting polynomial will be divisible by  $x^2 - 4x + 8$  ?
13. If

$$\cos\left(\sin^{-1} \frac{2}{\sqrt{5}} + \cos^{-1} x\right) = 0 \quad (5)$$

then  $x$  is equal to

- (A)  $\frac{1}{\sqrt{5}}$
- (B)  $-\frac{2}{\sqrt{5}}$
- (C)  $\frac{2}{\sqrt{5}}$
- (D)  $1$