1. The domain of the function $f(x) = \sqrt{x-1}$ is

(A) $(-\infty, \infty)$

(B) $(1, \infty)$

(C) $[1, \infty)$

(D) $[0, \infty)$

(E) $(0, \infty)$

2. Let $f(x) = -2x^2 + 1$ and $g(x) = 4x - 3$, then $(g \circ f)(-1)$ is equal to

(A) 9

(B) -9

(C) 7

(D) -7

(E) -8

3. Let A and B be finite sets such that $n(A - B) = 18$, $n(A \cap B) = 25$, and $n(A \cup B) = 70$. Then $n(B)$ is equal to

(A) 52

(B) 25

(C) 27

(D) 43

(E) 45

4. In a group of 100 persons, 80 can speak Malayalam and 60 can speak English. The number who speak English only is

(A) 40

(B) 30

(C) 20

(D) 25

(E) 35

5. If $a * b = \frac{a}{b} + \frac{b}{a} + \frac{1}{ab}$, then $2 * 5$ is

(A) 4

(B) 3

(C) 2

(D) 1

(E) 5

6. If $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 4, 6\}$, then $A - B =$

(A) {1,3,5,6}

(B) {0,1,3,5,6}

(C) {1,3,5}

(D) {1,2,3,4,5,6}

(E) {2,4}

7. Let $A = \{2, 3, 4, 5\}$, $B = \{36, 45, 49, 60, 77, 90\}$, and R be the relation "is factor of" from A to B. The range of R is

(A) {60}

(B) {36,45,60,90}

(C) {49,77}

(D) {49,60,77}

(E) {36,45,49,60,77,90}

8. The real part of $e^{(3+4i)x}$ is

(A) e^{3x}

(B) $\cos(7x)$

(C) $e^{3x}\cos(4x)$

(D) $e^{3x}\sin(4x)$

(E) 0

9. If $z = x - iy$ and $\sqrt[3]{z} = p + iq$, then

$$\frac{1}{p^2 + q^2}\left(\frac{x}{p} + \frac{y}{q}\right) =$$

(A) -2

(B) -1

(C) 1

(D) 2

(E) 0

10. Let $z = x + iy$ such that $|z + i| = 2$. Then the locus of z is a circle with center and radius

(A) (0, -1); 2

(B) (0, 2); 2

(C) (1, -1); 2

(D) (0, -1); $\sqrt{3}$

(E) (0, 2); $\sqrt{3}$

11. $\arg\left(\frac{1+i\sqrt{3}}{1-i}\right)$ equals

(A) $\frac{\pi}{6}$

(B) $\frac{\pi}{3}$

(C) $\frac{2\pi}{3}$

(D) $\frac{\pi}{2}$

(E) $\frac{5\pi}{6}$

12. If ω is a complex cube root of unity, then the value of $1 + \omega + \omega^2$ is

(A) 0

(B) 1

(C) -1

(D) ω

(E) ω^2

13. If $f(x) = x^2 - 2x$, then the minimum value of $f(x)$ is

(A) -2

(B) 0

(C) 1

(D) -1

(E) 2

14. Let $z_1 = 1 + i$, $z_2 = 2 - i$, then the product $z_1 \cdot z_2$ is

(A) 3 + i

(B) 1 + 3i

(C) 3 - i

(D) 1 - 3i

(E) 3 + 3i

15. The equation $z^4 + 1 = 0$ has

(A) only real roots

(B) only imaginary roots

(C) two real and two imaginary roots

(D) two complex and two real roots

(E) only complex roots

16. The number of subsets of the set $\{1, 2, 3, 4, 5\}$ is

(A) 10

(B) 20

(C) 25

(D) 32

(E) 64

17. The set of all even natural numbers is

(A) finite

(B) null

(C) infinite

(D) singleton

(E) empty

18. The binary operation $*$ on R defined by $a * b = a + b + ab$ is

(A) commutative only

(B) associative only

(C) both commutative and associative

(D) neither commutative nor associative

(E) distributive

19. The multiplicative inverse of $3 - 4i$ is

(A) $\frac{3+4i}{25}$

(B) $\frac{4-3i}{25}$

(C) $\frac{3-4i}{25}$

(D) $\frac{4+3i}{25}$

(E) $\frac{-3+4i}{25}$

20. If $A = \{a, b, c\}$, then the number of reflexive relations on A is

(A) 64

(B) 36

(C) 20

(D) 13

(E) 512