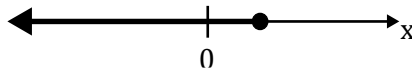# FUNCTION AND INEQUALITY AND
QUADRATIC EQUATION

1. Which one of the following is a representation (not to scale and in bold) of all values of x satisfying the inequality $2 - 5x \leq \frac{6x-5}{3}$ on the real number line?

    (A)

    (B)

    (C)

    (D)

2. If $f(x) = 2\ln(\sqrt{e^x})$, what is the area bounded by $f(x)$ for the interval $[0, 2]$ on the x-axis

    (A) 1/2   (B) 1
    (C) 2   (D) 4

3. Consider the following inequalities.

    (i) $3p - q < 4$
    (ii) $3q - p < 12$

    Which one of the following expressions below satisfies the above two inequalities?

    (A) $p + q < 8$

    (B) $p + q = 8$
    (C) $8 \leq p + q < 16$
    (D) $p + q \geq 16$

4. A function $y(x)$ is defined in the interval [0,1] on the x-axis as

    $$y(x) = \begin{cases} 2 \text{ if } 0 \leq x < \dfrac{1}{3} \\ 3 \text{ if} \dfrac{1}{3} \leq x < \dfrac{3}{4} \\ 1 \text{ if} \dfrac{3}{4} \leq x \leq 1 \end{cases}$$

    Which one of the following is the area under the curve for the interval [0,1] on the x-axis?

    (A) 5/6   (B) 6/5
    (C) 13/6   (D) 6/13

5. Let r be a root of the equation $x^2 + 2x + 6 = 0$.
    Then the value of the expression $(r + 2)(r + 3)(r + 4)(r + 5)$ is

    (A) 51   (B) -51
    (C) 126   (D) -126

6. Two straight lines pass through the origin $(x_0, y_0) = (0,0)$. One of them passes through the point $(x_1, y_1) = (1,3)$ and the other passes through the point $(x_2, y_2) = (1,2)$.

What is the area enclosed between the straight lines in the interval [0,1] on the x-axis?

(A) 0.5   (B) 1.0

(C) 1.5   (D) 2.0

7. Consider the following inequalities,

(i) $2x - 1 > 7$

(ii) $2x - 9 < 1$

Which one of the following expressions below satisfies the above two inequalities?

(A) $x \le -4$ (B) $-4 < x \le 4$

(C) $4 < x < 5$ (D) $x \ge 5$

8. Four points $P(0,1), Q(0,-3), R(-2,-1),$ and $S(2,-1)$ represent the vertices of a quadrilateral. What is the area enclosed by the quadrilateral?

(A) 4   (B) $4\sqrt{2}$

(C) 8   (D) $8\sqrt{2}$

9. If $\left(x - \frac{1}{2}\right)^2 - \left(x - \frac{3}{2}\right)^2 = x + 2$, then the value of x is

(A) 2   (B) 4

(C) 6   (D) 8

10. A super additive function $f(\cdot)$ satisfies the following property

$f(x_1 + x_2) \ge f(x_1) + f(x_2)$

Which of the following functions is a super additive function for $x > 1$?

(A) e^x (B) $\sqrt{x}$

(C) $1/x$ (D) e^{-x}

11. a, b, c are real number. The quadratic equation $ax^2 - bx + c = 0$ has equal roots, which is β, then

(A) $\beta = b/a$

(B) $\beta^2 = ac$

(C) $\beta^3 = bc/(2a^2)$

(D) $b^2 \ne 4ac$

12. Consider the following equations of straight lines:

Line L1: $2x - 3y = 5$

Line L2: $3x + 2y = 8$

Line L3: $4x - 6y = 5$

Line L4: $6x - 9y = 6$

Which one among the following is the correct statement?

(A) L1 is parallel to L2 and L1 is perpendicular to L3

(B) L2 is parallel to L4 and L2 is perpendicular to L1

(C) L3 is perpendicular to L4 and L3 is parallel to L2

(D) L4 is perpendicular to L2 and L4 is parallel to L3

Answer key:

1	C
2	C
3	A
4	C
5	D
6	A

7	C
8	C
9	B
10	A
11	C
12	D