1. The graph of y = p(x) is shown in Figure 1 for some polynomial p(x). Find the number of zeroes of p(x).

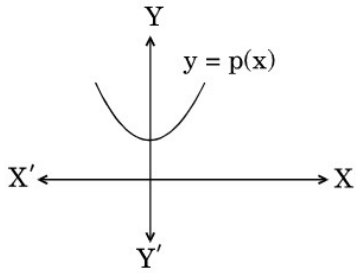

Figure 1:

2. If $f(x) = \frac{1-x}{1+x}$, then find $(f \circ f)(x)$.

3. Let W denote the set of words in the English dictionary. Define the relation R by $R = \{(x, y) \in W \times W \mid x$ and y have at least one letter in common$\}$. Show that this relation R is reflexive and symmetric, but not transitive.

4. Find the inverse of the function $f(x) = (\frac{4x}{3x+4})$.

5. The value of k(k < 0) for which the function f defined as

$$f(x) = \begin{cases} x^2, & \text{if } x < 0 \\ \sin(x), & \text{if } x \geq 0 \end{cases}$$

is continuous at x = 0 is:

   (a) ± 1
   (b) ± 1
   (c) $\pm \frac{1}{2}$
   (d) $\frac{1}{2}$

6. Find the intervals in which the function f given by f (x) = x 2 – 4x + 6 is strictly increasing:

   (a) a) (-∞,2) ⋃ (2,∞)
   (b) b) (2,∞)
   (c) c) (-∞,2)
   (d) d) (-∞,2) ⋃ (2,∞)

7. The real function f(x) = 2x3 – 3x2 – 36x + 7 is:

   (a) a) Strictly increasing in (-∞,-2) and strictly decreasing in (-2,∞)
   (b) b) Strictly decreasing in (-2,3)
   (c) c) Strictly decreasing in (-∞,3) and strictly increasing in (3,∞)
   (d) d) Strictly decreasing in (-∞,2) $\bigcup$ (3,∞)

8. The value of b for which the function $f(x) = x + cosx + b$ is strictly decreasing over $\mathbf{R}$ is:

   (a) b < 1
   (b) No value of b exists
   (c) ≤ 1
   (d) b ≥ 1

9. The point(s), at which the function f given by

$$f(x) = \begin{cases} \frac{x}{|x|}, x < 0 \\ -1, x \geq 0 \end{cases}$$

   is continuous, is/are:

   (a) $x \varepsilon$R
   (b) $x = 0$
   (c) xε R -{0}
   (d) x = -1 and 1

10. The area of a trapezium is defined by function f and given by $f(x) = (10 + x)\sqrt{100 - x^2}$, then the area when it is maximised is:

    (a) $75cm^2$
    (b) $7\sqrt{3}cm^2$
    (c) $75\sqrt{3}cm^2$
    (d) $5cm^2$

11. If tan^{-1} x = y, then:

    (a) -1 < y < 1
    (b) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$
    (c) $\frac{-\pi}{2} < y < \frac{\pi}{2}$
    (d) y $\varepsilon\{\frac{-\pi}{2}, \frac{\pi}{2}\}$