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).

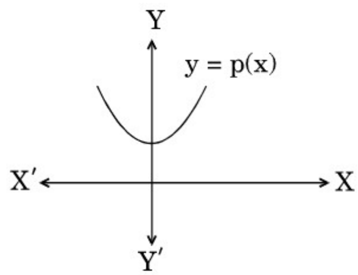

Figure 1:

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) $(-\infty, 2) \bigcup (2, \infty)$
   (b) (2,∞)
   (c) (-∞,2)
   (d) (-$\infty, 2) \bigcup (2, \infty)$

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

   (a) Strictly increasing in $(-\infty, -2)$ and strictly decreasing in $(-2, \infty)$

   (b) Strictly decreasing in $(-2, 3)$

   (c) Strictly decreasing in $(-\infty, 3)$ and strictly increasing in $(3, \infty)$

   (d) Strictly decreasing in (-∞, 2) $\bigcup (3, \infty)$

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) $b \leq 1$

   (d) $b \geq 1$

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) x$\varepsilon R - \{0\}$

   (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) $y \varepsilon \{\frac{-\pi}{2}, \frac{\pi}{2}\}$