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).

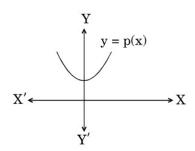


Figure 1:

- 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

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

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) $(2, \infty)$
 - (c) $(-\infty, 2)$
 - (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 $(-\infty, 2) \bigcup (3, \infty)$
- 8. The value of b for which the function $f(x) = x + \cos x + b$ is strictly decreasing over **R** is:
 - (a) b < 1
 - (b) No value of b exists
 - (c) $b \le 1$
 - (d) $b \ge 1$
- 9. The point(s), at which the function f given by

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

is continuous, is/are:

- (a) $x \in R$
- (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) $\frac{-\pi}{2} \le y \le \frac{\pi}{2}$
 - (c) $\frac{-\pi}{2} < y < \frac{\pi}{2}$
 - (d) $y\varepsilon\{\frac{-\pi}{2},\frac{\pi}{2}\}$