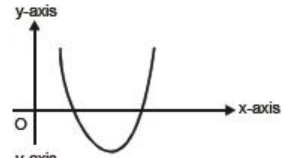
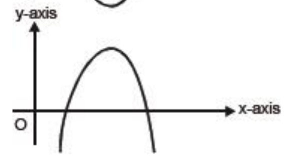
Ch-2 Polynomials

1. **Zeroes of a polynomial** – k is said to be zero of a polynomial p(x), if p(k) = 0.
2. **Graph of polynomial –**





   a. Graph of a linear polynomial p(x) = ax + b is a straight line.
   b. Graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ is a parabola open upwards like ∪, if a > 0.
   c. Graph of a quadratic polynomial $p(x) = ax^2 + bx + c$ is a parabola open downwards like ∩, if a > 0.
   d. In general, a polynomial p(x) of degree 'n' crosses the x-axis at most 'n' points.
3. **Relationship between the zeroes and the coefficients of a Polynomial –**
   a. If α, β are zeroes / roots of $p(x) = ax^2 + bx + c$, then
      Sum of root $\alpha + \beta = \frac{-b}{a} \Rightarrow \alpha + \beta = \frac{-(\text{coefficient of } x)}{\text{coefficient of } x^2}$, and
      Product of roots $= \alpha.\beta = \frac{c}{a} \Rightarrow \alpha.\beta = \frac{\text{constant term}}{\text{coefficient of } x^2}$.
   b. If α, β and γ are zeroes / roots of $p(x) = ax^3 + bx^2 + cx + d$
      Sum of roots $= \alpha + \beta + \gamma = \frac{-b}{a} = \frac{-(\text{coefficient of } x^2)}{\text{coefficient of } x^3}$,
      Sum of products of roots, taken 2 at a time $= \alpha.\beta + \beta.\gamma + \gamma.\alpha = \frac{c}{a} = \frac{\text{coefficient of } x}{\text{coefficient of } x^3}$, and
      Product of roots $= \alpha.\beta.\gamma = \frac{-d}{a} = \frac{-(\text{contant term})}{\text{coefficient of } x^3}$.
   c. If α, β are roots of a quadratic polynomial p(x), then $p(x) = x^2 - (\alpha + \beta)\, x + \alpha\beta \Rightarrow p(x) = x^2 -$ (sum of roots) x + product of roots
   d. If α, β and γ are zeroes of a cubic polynomial p(x). Then, $p(x) = x^3 - (\alpha + \beta + \gamma)\, x^2 + (\alpha\beta + \beta\gamma + \alpha\gamma)\, x - (\alpha\beta\gamma) \Rightarrow p(x) = x^3 -$ (sum of zeroes) x^2 + (sum of product of zeroes / roots taken two at a time)x – (product of zeroes)