1. Use the Binomial Theorem to:
   (a) Expand \((3x - y)^5\).
   (b) Find the coefficient of \(x^4y^6\) in \((2x + 3y)^{10}\).
   (c) Prove \(\sum_{k=0}^{n} k \binom{n}{k} = n 2^{n-1}\) \(\text{Hint: Differentiate } (x + 1)^n)\).

2. Explain why a graph with 5 vertices cannot have more than 10 edges.

3. Explain why a graph with \(n\) vertices cannot have more than \(\frac{n(n-1)}{2}\) edges.

4. Either draw a graph with the following properties or show that it is not possible.
   (a) 4 vertices of degrees 3, 3, 4, 4.
   (b) 5 vertices of degrees 1, 1, 1, 1, 1.
   (c) 5 vertices of degrees 1, 1, 1, 2, 5.
   (d) 6 vertices of degrees 1, 2, 2, 2, 2, 5.
   (e) 6 vertices of degrees 1, 2, 3, 3, 4, 4.