1. Give an example query instance where the optimal join tree (using $C_{out}$) is bushy and includes a cross product. (3)

2. Give a justification why most optimization algorithms ignore cross products. (2)

3. Show that for chain queries the number of left-deep trees without cross products is:

\[ f(n) = 1 + \sum_{k=1}^{n-1} f(k - 1) \times f(n - k) = 2^{n-1} \]