SEF015: Discrete Mathematics (2022-23)

Material for the <u>Q&A session</u> *or…Tutorial 7 (Week 8)*

This material is for your tutorial in Week 8 and is designed to help your understanding. Please try to answer <u>all the questions</u> before you join your tutorial group.

Number of pages: 1

Question 1*. Prove, using mathematical induction, that
$$1 + 4 + 7 + \cdots + (3n - 5) + (3n - 2) = \frac{n(3n - 1)}{2},$$
for all positive integers n.

Question 2*. Prove, using mathematical induction, that
$$\frac{1}{1 \cdot 3} + \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \cdots + \frac{1}{(2n - 1)(2n + 1)} = \frac{n}{2n + 1},$$
for all positive integers n.

Question 3*. Prove, using mathematical induction, that $8^n - 3^n$ is divisible by 5 for all integers $n \geq 1$.

Question 4*. Prove, using mathematical induction, that
$$1^3 + 2^3 + 3^3 + \cdots + n^3 = \frac{(n(n + 1))^2}{4},$$
for all positive integers n.

Question 5. Prove, using mathematical induction, that
$$1 + \frac{1}{2} + \frac{1}{4} + \cdots + \frac{1}{2^{n-1}} = 2(1 - \frac{1}{2^n}),$$
for all positive integers n.