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CSIS 213-3941

Assignment 7&8 Quiz Part 2

**Question 1**

Find an explicit formula for the sequence of the form a1, a2, a3, . . . where n ≥ 1, with the initial terms as follows:

https://msjc.instructure.com/assessment_questions/507250/files/89441/download?verifier=G7eZ8kwGQIDVKcWg7NOsdz3P2a1wvNLqHwLrA8lS

After you found the formula, prove it by mathematical induction.

**Explicit Formula: an** = 1 / (n) – 1 / (n+1) for all integers n ≥ 1

**Proof of Correctness:**

Let the property P(n) be the equation

an = 1/(n) – 1/(n+1)

***Show that P(1) is true:***

To establish P(1), we must show that

a1 = 1/1 – 1/(1 + 1)

Left hand side of P(1) is

a1 =1 – ½

Right hand side of P(1) is

1/1 – 1/(1 + 1) = 1 – ½

Thus the two sides of P(1) equal the same quantity, and hence P(1) is true.

***Show that for all integers k ≥ 1, if P(k) is true then P(k + 1) is also true:***

*[Suppose that P(k) is true for a particular but arbitrarily chosen integer* k ≥ 1.]

Suppose that k is any integer with k ≥ 1 such that

ak = 1/k – 1/(k + 1)

We must show that

ak  = 1/(k+1) – 1/[(k + 1) + 1]

Or ak = 1/(k + 1) – 1/(k + 2)

We must show that P(1) = P(1 + 1) thus

ak + 1 = 1/(k + 1) – 1/(k + 2)

a1 + 1 = 1/(1 + 1) – 1/(1 + 2)

a1 + 1 = ½ - 1/3

a2 = ½ - 1/(2 + 1)

a2 = ½ - 1/3

which shows that both P(1) and P(1 + 1) are both true.