**Answer on Question #85800 – Math – Discrete Mathematics**

**Question**

Prove that for all integers n, n(n + 2)(n + 4) is divisible by 3.

**Solution**

There are only 3 possible remainders when dividing by 3, namely 0, 1, 2.
If n has the remainder 0 (that is, n mod 3 = 0), it means that n is divisible by 3 and hence n(n + 2)(n + 4) is divisible by 3 too because n is a multiplier of the expression n(n + 2)(n + 4).
If n has the remainder 1 (that is, n mod 3 = 1), then (n+2) is divisible by 3 because (n+2) has the remainder 1+2 =3 and it is the same as to have the remainder 0 mod 3, therefore n(n + 2)(n + 4) is divisible by 3 too.
If n has the remainder 2 (that is, n mod 3 = 2), then (n+4) is divisible by 3 because (n+4) has the remainder 2+4 =6 and it is the same as to have the remainder 0 mod 3, therefore n(n + 2)(n + 4) is divisible by 3 too.
Thus, in any case n(n + 2)(n + 4) is divisible by 3.