**2.sol** let P(n) = (n2 + n + 2)/2 we need to prove ∀n ϵ N P(n)

**Basis Step:**

n = 1

P(1) = (12 + 1 + 2)/2 = 2

One Line separates the Plane into 2 regions above the line and below the line.

∴ P(1) True

**Inductive Step:**

Let us assume P(k) is True (Induction Hypothesis)

P(k) = (k2 + k + 2)/2

k Lines separate the Plane into (k2 + k + 2)/2 regions

We have to prove p(k+1) is True

We know that no two lines are parallel and no three lines are concurrent

Now the new (k+1) th line we introduce intersects with all other k lines and do not

pass through intersection point of any other lines as no three lines are concurrent

Thus the (k+1) th line passes through (k+1) regions from the (k2 + k + 2)/2 regions

(k+1) th line divides each of k+1 region into 2 regions

∴ k+1 new regions added

Total regions after (k+1) th line added = (k2 + k + 2)/2 + (k+1)

= (k2 + k + 2 + 2(k+1))/2

= ((k2+2k+1) + (k+1) + 2)/2

= ((k+1)2 + (k+1) + 2)/2 = P(k+1)

∴ p(k+1) True

By Principle of Mathematical Induction ∀ n ϵ N P(n) is True

∴ n lines separate a plane into (n 2+n+2)/2 regions if no two lines are parallel and no three pass

through a common point is proved by Mathematical Induction

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