

(* This Function computes the value of $S(p^n)$ *)

Clear[SofP]

(* SofP[n_] := ((2n)!/(n!*n!))(1/2)^(2*n) is the factorial definition *)

(* What follows is the Gamma Definition -- any n works here *)

SofP[n_] := (Gamma[2*n+1]/Gamma[n+1]^2)(1/2)^(2*n)

(* The Function SSN computes S(n) for any positive integer n *)

Clear[SSN]

SSN[n_] := 1 /; n == 1

SSN[n_] := Product[SofP[Part[FactorInteger[Floor[n]], j, 2]], {j, 1, Length[FactorInteger[Floor[n]]}] /; Abs[n - Floor[n]] <= .00001

SSN[n_] := SofP[n] /; Abs[n - Floor[n]] > .00001

(***** Begin your work below here *****)

v1 = 5 + 3*I;

s1 = Sum[N[SSN[n]/n^(v1), 12], {n, 1, 1000000}]

s2 = N[Sqrt[Zeta[v1]], 12]

0.99024911347-0.0128310649487 I

0.990249113473-0.012831064949 I