ESA414/ESA614 Computational Astrophysics
MS A&A and Dual degree

Quiz-1 24 August 2019 *(For 26 August 2019)*

Total marks : 15

1. Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of $1/\pi$.

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

Write a function that uses this formula. Compute the summation, till the last term is smaller than 10^{-15}. Check the result with *numpy.pi*.

[6 marks]

2.

(a) The function below approaches Heaviside step function for $\alpha = 10$. Plot this for various values of α . Label different curves with the corresponding α values

(b) Use Lagrange interpolation with 11 points and see how good an approximation can you obtain for the function. How does this interpolation compare with spline (use scipy spline)?

$$f(x) = \frac{1 + \tanh 2\alpha x}{2}.$$

[3 + 6 makrs]