1. The amount of lowering of water level, s, in a well at a time t, due to pumping from groundwater is governed by an equation of the form s=A W(u), where A is a constant (proportional to the discharge), W is called the Well Function, and u is inversely proportional to t. The well function is given by the equation dW(u)/du = -Exp(-u)/u. If the value of W(1) is 0.2194, find the value of W(0.5) using (a) Romberg integration algorithm with accuracy O(h6) (b) Modified Euler with h= −0.5 (c) Heun’s method with h= −0.25 and (d) Fourth-order Runge-Kutta method with h= −0.25.

2. Using a series expansion for exp(−u), integrating term by term, and minimizing the error, an approximate expression for W(u) for u less than 1 is obtained as: W(u)= − ln u – 0.57722 + 0.99999 u – 0.24991 u2 + 0.05519 u3 – 0.00976 u4 + 0.00108 u5. Perform an error analysis for the results obtained in the previous problem, using the true value obtained from this expression.