TEZPUR UNIVERSITY

Test-III(Assignment), Spring Semester, 2019

MS103: MATHEMATICS II

Full Marks: 25

Each question carries 5 marks.

1. Use the Trapezoidal and Simpson's rules to estimate the value of $\int_1^2 \sqrt{1+4x^2}\sin dx$ using 8 strips. Also compare with the exact value.

2. Use the Runge-Kutta method and the Euler method to find the value of y when $x = 1$ given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$. Also compare with the exact value.

3. Show that the complex valued function defined by $f(z) = \begin{cases} \frac{z^5}{|z|^4}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ is continuous and that Cauchy-Riemann equations hold at the origin but yet is not differentiable there.

4. Check the analyticity of the functions $f(z) = \log z$ and $g(z) = \text{Re}(z^3)$.

5. Let a function f be continuous on a closed bounded region R, and let it be analytic and not constant throughout the interior of R. Assuming that $f(z) \neq 0$ anywhere in R, prove that $|f(z)|$ has minimum value in R which occurs on the boundary of R and never in the interior. Also give an example to show that the condition $f(z) \neq 0$ anywhere in R, is necessary in order to obtain the result, i.e. show that $|f(z)|$ can reach its minimum value at an interior point when the minimum value is zero.

Note: Please write all the steps in detail, otherwise marks will be deducted accordingly. You can submit the assignment to any of the course instructors teaching Mathematics II (MS105) in current semester. The last date of submission of this assignment is 29.04.2019.

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