Sikkim Manipal Institute of Technology
Department of Mathematics
B.Tech Mechanical Engineering (Sem IV)
Subject: Numerical Methods (MA 1405)
Problem Sheet

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1 Taylor Series Method to solve ODEs

1. Using Taylor Series method, find $y(0.1)$ and $y(0.2)$ for $\frac{dy}{dx} = 1 + xy$ with $y(0) = 2$ correct upto three decimal places.
2. Using Taylor Series method, find $y(0.1)$ for $\frac{dy}{dx} = x + y$ with $y(0) = 1$ correct upto three decimal places.
3. Using Taylor Series method, find $y(0.1)$ and $y(0.2)$ for $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1$ correct upto three decimal places.
4. Using Taylor Series method, find $y(0.2)$ and $y(0.4)$ for $\frac{dy}{dx} = xy^2 + 1$ with $y(0) = 1$ correct upto three decimal places.
5. Using Taylor Series method, find $y(1.1)$ and $y(1.2)$ for $\frac{dy}{dx} = y + x^3$ with $y(1) = 1$ correct upto three decimal places.

2 Picard's Method to solve ODEs

6. Using Picard's method, find $y(0.1)$ for $\frac{dy}{dx} = 1 + xy$ with $y(0) = 2$ correct upto four decimal places.
7. Find the successive approximate solutions of the differential equation $\frac{dy}{dx} = y$, $y(0) = 1$ by Picard's method and compare it with the exact solution.
8. Given $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$ with $y(0) = 0$, use Picard's method to obtain y for $x = 0.25, 0.5$ correct to 3 decimal places.

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Problem Sheet Solutions

1. $y(0.1) = 2.11$ and $y(0.2) = 2.243$.

6. $y(0.1) = 2.1104$

8. $y(0.25) = 0.005$ and $y(0.5) = 0.042$.