Indian Institute of Technology Jodhpur
MAL1010, Quiz-3, 17 Jan'22

Time: 45Min Marks: 15

Name: ..... Roll No: .....

Q.1. How many real roots does the following equation have?

$$3^x + 4^x = 5^x.$$

[3]

Q.2. Let $f(x) = \frac{x^3}{3} - \frac{x^2}{2} - 2x + \frac{1}{3}$.
(i) Locate the intervals where f is increasing and decreasing.
(ii) Locate the point of local minimum and local maximum for f and calculate them.
(iii) Locate the intervals where f is concave up and concave down?
(iv) Sketch the graph of f.

[5]

Q.3. Use Lagrange's Mean Value Theorem, show that $9^{1/3} < \frac{25}{12}$

[3]

Q.4. If $f : \mathbb{R} \to \mathbb{R}$ is differentiable at $c \in \mathbb{R}$. show that

$$f'(c) = \lim_{n\to\infty} \left(n\{f(c + \frac{1}{n}) - f(c)\} \right).$$

However, show that by counter example, the existence of limit of this sequence does not imply that the existence of $f'(c)$.

[4]