Answer and hints of tutorial Sheet - 1 AUTUMN 2018

MATHEMATICS-I (MA10001) *August 1, 2018*

1. i. Ans. $c = 1$

    ii. Ans. $c = -1.2153, \quad 0.5486$

2. Ans. $c = -2$

3. Hint- Apply Rolle's theorem on $f(x)$ and get the expression $\dfrac{n}{m} = \dfrac{b-c}{c-a}$.

4. Hint- Use Rolle's theorem twice.

5. i. Hint- Let $g(x) = e^{-x} \int_0^x f(t)dt$ and apply Rolle's theorem on $g(x)$.

    ii. Hint- Let $\phi(x) = f(x) - \dfrac{(x-b)(x-c)}{(a-b)(a-c)}f(a) - \dfrac{(x-c)(x-a)}{(b-c)(b-a)}f(b) - \dfrac{(x-a)(x-b)}{(c-a)(c-b)}f(c)$
    and apply Rolle's theorem on $\phi(x)$.

6. Ans. $c = -1.0973$

7. Hint- Define $f(x)$ on $[a,b]$ such that $a, \ b$ are the roots of $f(x)$. Apply LMVT on $f(x)$.

8. i. Ans. $f(2) \le 7$

    ii. Ans. $\sqrt[3]{28} \approx 3.037$ Hint- Let $f(x) = \sqrt[3]{28}$ and $x \in [27, 28]$. Use LMVT.

9. Hint- Let
$$g(x) = \begin{vmatrix} f(x) & f(b) \\ \phi(x) & \phi(b) \end{vmatrix}$$

on $[a, b]$ and apply LMVT on $g(x)$.

10. Hint- Let $f(t) = (1+t)^n$ and $t \in [0, x]$.

11. Ans. $f(0) \le 11,$ Hint- Use LMVT.

12. Hint- Let $f(x) = 1 - \cos x$ and $g(x) = \dfrac{x^2}{2}$ on $x \in [0, x]$. Use CMVT.

13. i. Hint- Let $h(x) = \dfrac{f(x)}{x}$ and $g(x) = \dfrac{1}{x}$ on $[a, b]$. Use CMVT.

     ii. Hint- Let $h(x) = f(x)$ and $g(x) = x^2$ on $[0, 1]$. Use CMVT.

     iii. Hint- Apply CMVT thrice.