Department of Mathematics
School of Advanced Sciences
Fall Semester 2022-2023
Continuous Assessment Test - I (November 2022)

Course Code: BMAT101L **Course Title:** Calculus
Max. Time: 90 minutes **Slot:** D1+TD1 **Max. Marks:** 50

Answer all the questions
(Each question carries 10 marks)

1. Using the first and second derivative tests and discuss the monotonicity, relative extrema, concavity and the points of inflection of $f(x)=\frac{2x^3}{3}+\frac{x^2}{2}-x$

2. (a) Find the volume of the solid generated by revolving the region bounded by the curves $y=\sqrt{x-2}, y=x-2$ about the line $x=3$

   (b) Verify Lagrange's Mean value theorem for the function $f(x)=x^2-3x+5$ on $[1,4]$.

3. (a) Find the area of the region enclosed by the curves $y=\sin x$ and $y=\cos x$ on $[0,\frac{\pi}{2}]$

   (b) Verify Rolle's theorem for the function $f(x)=\sqrt{1-x^2}$ on $[-1,1]$.

4. (a) If $u=x\log xy$, where $x^3+y^3+3xy=1$ then find $\frac{du}{dx}$

   (b) If $u=e^{xyz}$, show that $\frac{\partial^3 u}{\partial x\partial y\partial z}=(1+3xyz+x^2y^2z^2)e^{xyz}$.

5. Verify the functional dependence of the functions $u=4x+2y-z$, $v=x+8y-10z, w=x-2y+3z$. If they are functionally dependent find the relation between them.