AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH
Faculty of Science & Technology
Department of Mathematics
MAT1205: Integral Calculus and Ordinary Differential Equations

Assignment 1

1. **Evaluate the followings integrals:**

   (a) $\int_2^4 \int_0^3 (x+y)dxdy$

   (b) $\int_0^1 \int_x^y xy\, dydx$

   (c) $\int_0^1 \int_{y^2}^y (x^2y + xy^2)dxdy$

   (d) $\int_1^2 \int_1^y (\frac{1}{x} + \frac{1}{y})dxdy$

   (e) $\int_0^1 \int_0^{\sqrt{x}} ye^{x^2}\, dy\, dx$

   (f) $\int_0^{\sqrt{\frac{\pi}{2}}} \int_0^{x^2} x\cos y\, dy\, dx$

   (g) $\int_0^1 \int_0^{x^2} (x^2+y)dydx$

   (h) $\int_0^{\pi/2} \int_0^2 r\sqrt{4-r^2}\, dr\, d\theta$

   (i) $\int_0^1 \int_{-x}^x (x^2-y^2)dy\, dx$

   (j) $\int_0^{\frac{\pi}{2}} \int_0^{\sin\theta} r\cos\theta\, drd\theta$

2. **Evaluate the following integrals:**

   (a) $\iint_R (xy - y^2)dA$ where R is rectangle whose vertices are $(-1,0)$, $(0,0)$, $(0,1)$, and $(-1,1)$.

   (b) $\iint_R (2x+y)\, dA$ over the rectangle $R = \{(x,y)|3 \le x \le 5, 1 \le y \le 2\}$.

   (c) $\iint_R (x^2 + y^2)\, dA$ where R is rectangle whose vertices are $(0,1), (1,1), (1,2)$ and $(0,2)$.

   (d) $\iint_R x\, dA$ over the triangular region R enclosed by the lines $x + 2y = 2, x = 0$ and $y = 0$.

3. Sketch the region and **using** double integrals, find the finite area bounded by the following curve (s).

   (a) $y = 2x - x^2$ and x-axis

   (b) $x^2 = 4y, 8y = x^2 + 16$

(c) $y = -x,\ x = 0,\ y = 2$

4. **Evaluate the following integrals:**

   (a) $\int_1^2 \int_0^1 \int_{-1}^1 (x^2 + y^2 + z^2)\,dxdydz$

   (b) $\int_0^1 \int_0^{y^2} \int_0^{x+y} x\ dzdxdy$

   (c) $\int_0^1 \int_0^x \int_0^{x-y} xdzdydx$

   (d) $\int_0^2 \int_{-1}^{y^2} \int_{-1}^z yzdxdzdy$

   (e) $\int_0^{2\pi} \int_0^2 \int_0^{4-r^2} zr\ dzdrd\theta$

   (f) $\int_0^{2\pi} \int_0^\pi \int_0^a r^3 \sin\theta\ drd\theta d\varphi$

5. Find the mass and center of mass of the lamina that occupies the region D and has the given density function ρ. Where $D = \{(x,y)|0 \le x \le 1,\ 0 \le y \le 2\}$ and $\rho(x,y) = y^2$.

6. Find the mass and center of mass of the lamina that occupies the region D and has the given density function ρ. Where $D = \{(x,y)|0 \le x \le 1,\ 0 \le y \le 1\}$ and $\rho(x,y) = 2x$.

Instruction of submission:

- Write down the answer on paper.
- Scan and make one pdf file.

  or

- Take photo and compile all photos in one word file.
- Give the name of the file (Section, Name, ID).
- Submit assignment in the assignment section of Microsoft TEAMS and turn on.
- Submit by 21 August (Friday).