# BRAC
## UNIVERSITY

*Inspiring Excellence*

## Department of Mathematics and Natural Sciences
## MAT120 : Integral Calculus and Differential Equations
## Assignment-2

---

**Name:**

**Section:**

**ID:**

---

**Use this page as the cover page of your assignment.**                    Total $20 \times 5 = 100$.

(1) Discuss the nature of following improper integrals:                    [3]

    a. $\int_0^\infty \frac{x}{x^4+1}\,dx$,

    b. $\int_{-\infty}^\infty \frac{1}{e^x+e^{-x}}\,dx$,

    c. $\int_0^2 \frac{1}{1-x^2}\,dx$

    d. $\int_{-3}^1 \frac{x\,dx}{\sqrt{9-x^2}}$

(2) Evaluate the following integrals (write your answer in simplified form) ;                    [2]

    a. $\int_0^1 (1-\frac{1}{x})^{\frac{1}{3}}\,dx$,

    b. $\int_0^4 y^3 \sqrt{64-y^3}\,dy$,

    c. $\int_0^{\pi/2} \sin^5 x\,dx$,

    d. $\int_0^\pi \sin^7 x \cos^4 x\,dx$

    e. $\int_0^\infty \frac{1}{1+x^4}\,dx$,

    f. $\int_0^3 \frac{x^2}{\sqrt{3-x}}\,dx$,

    g. $\int_0^{\pi/6} \sin^6 6x \cos^4 3x\,dx$,

    h. $\int_0^1 (\frac{x}{\ln x})^{\frac{1}{3}}\,dx$,

    i. $\int_0^1 \frac{dx}{\sqrt{x\ln(\frac{1}{x})}}$

    j. $\int_0^a y^7 \sqrt{a^5-y^5}\,dy$

(3) Find the exact arc length of the curve over the interval
a. $x = \frac{1}{3}(y^2+3)^{\frac{3}{2}},\ (0 \le y \le 1)$    b. $x = e^t(\cos t + \sin t),\ y = e^t(\cos t - \sin t),\ (1 \le t \le 4)$

(4) Find area of surface generated by revolving the given curve about x-axis (a & b) & y-axis (c & d).
a. $y = \sqrt{4-x^2},\ -1 \le x \le 1$.    b. $x = y^{\frac{1}{3}},\ 1 \le y \le 8$.    c. $x = \sqrt{9-y^2},\ -2 \le y \le 2$.
d. $x = 2\sqrt{1-y},\ -1 \le y \le 0$