Shantilal Shah Engineering College ,Bhavnagar

B.E. Sem-I (All Branches) ***Sub : Mathematics-1(3110014)***

Review Assignment-1

Topic: Indeterminate form, Beta-Gamma functions, Improper Integral, area and Volume.

Ex-1 Solve the following:

1. $\lim_{x\to 0}\frac{\tan x - x}{x^2\tan x}$ 2. $\lim_{x\to\frac{1}{2}}\frac{\cos^2\pi x}{e^{2x}-2ex}$ 3. $\lim_{x\to 0}\sin^2\frac{x}{2}\ln x$

4. $\lim_{x\to 0}\frac{1}{x}(1-x\cot x)$

Ex-2 Define Beta and Gamma function and state relation between Beta and Gamma functions.

By Using Beta and Gamma functions evaluate / Prove the followin

1. $\beta\left(\frac{9}{2},\frac{7}{2}\right)$, β denote Beta function
2. Prove that $\beta(m,n)=\beta(m,n+1)+\beta(m+1,n)$, β denote Beta function.

Ex-3 Evaluate the following Improper Integrals:

1. $\int_0^\infty \frac{1}{1+x^2}dx$
2. $\int_{-\infty}^\infty \frac{1}{e^x+e^{-x}}dx$
3. Check the convergence of $\int_0^\infty \frac{1}{(1+x^2)(1+\tan^{-1}x)}dx$

Ex-4 (1) Find the volume of the solid of revolution of the area about x-axis bounded by the curve $y=xe^x$ and the straight lines $x=1 \& y=0$.

(2) Find the volume of the solid that results the region enclosed by the curves $y=x^2$ and $x=y^2$ is revolved about Y-axis.

Ex-5 Find the area of the surface generated by revolving $y=\sqrt{9-x^2}$ on [-2,2] about x- axis.

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Review Assignment-2

Topic:Multiple Integral & Fourier Series

Ex-1 (a) Evaluate $\int_0^1 \int_0^{x^2} (x^2+y^2)dA$,where dA indicate small area in XY-plane.

(b) Evaluate $\iint r\sqrt{a^2-r^2}\,dr d\theta$ over the upper half of the circle $r = a\cos\theta$.

Ex-2 Evaluate: $\iint_R \frac{x}{y}\,dxdy$,where R is the Region in first quadrant bounded by $y = x, y = 2x. x = 1, x = 2.$

Ex-3 Change the order of Integration and evaluate it :

(a) $\int_0^1 \int_2^{4-2x} dydx$ (b) $\int_0^1 \int_1^{e^x} dydx$ (c) $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} xydydx$

Ex-4 Sketch the region of integration, reverse the order of integration and Evaluate the integral $\int_0^2 \int_0^{4-x^2} \frac{xe^{2y}}{4-y}\,dydx$.

Ex-5 Evaluate $\int_0^4 \int_{\frac{y}{2}}^{\frac{y}{2}+1} \frac{2x-y}{2}\,dxdy$ by applying the transformations $u = \frac{2x-y}{2}, v = \frac{y}{z}$ and integrating over an appropriate region in the uv-plane.

Ex-6 Evaluate $\int_0^a \int_0^{\sqrt{a^2-y^2}} y^2\sqrt{x^2+y^2}\,dydx$ by changing into polar coordinators.

Ex-7 Evaluate the following triple integral :

(a) $\int_0^1 \int_0^{\sqrt{z}} \int_0^{2\pi} (r^2\cos^2\theta + z^2) r d\theta dr dz$ (b) $\int_0^1 \int_0^{2-x} \int_0^{2-x-y} dzdydx$

Ex-8 Obtain Fourier series to represent $f(x) = x^2$ in interval $-\pi < x < \pi$.

Also deduce that (1) $\sum_{(1)n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} = \frac{\pi^2}{12}$ (2) $\sum_{n=1}^{\infty} \frac{1}{n^2}\frac{\pi^2}{6}$

Ex-9 Find the Fourier sine series of $f(x) = \cos 2x, [0, \pi]$.

Ex-10 Find the half-range cosine series for $f(x) = e^x$, $0 < x < \pi$.