Indian Institute of Technology Kharagpur
Department of Mathematics
MA11003 - Advanced Calculus
Problem Sheet -13A
Autumn 2022

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1. Evaluate the triple integral
   (i) $\int_0^{\log 2}\int_0^{x}\int_0^{x+\log y} e^{x+y+z}dzdydx$ directly.
   (ii) $\int_0^{5}\int_0^{\sqrt{25-x^2}}\int_0^{6} \frac{dzdydx}{\sqrt{x^2+y^2}}$ using cylindrical coordinates.
   (iii) $\int_0^{1}\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} \frac{dzdydx}{1+x^2+y^2+z^2}$ using spherical coordinates.

2. Compute $\iiint xy\ dzdydx$ over the volume enclosed by planes $z = x + y$ and $z = 0$, and between the surfaces $y = x^2$ and $x = y^2$.

3. Compute $\iiint \frac{z\ dzdydx}{\sqrt{x^2+y^2}}$ if the region is bounded by paraboloid $x^2 + y^2 = 2z$ and the cylinder $x^2 + y^2 = 4$ in the first octant.

4. Find the integral $\iiint e^{(x^2+y^2+z^2)^{3/2}}dxdydz$ in the region $R = x, y, z \geq 0, x^2 + y^2 + z^2 \leq 1$ using spherical coordinates.
