

Indian Institute of Technology Kharagpur
Department of Mathematics
MA11003 - Advanced Calculus
Answer Hints Problem Sheet - 9
Autumn 2020

1. Hints: Compute the ranges of x, y and then calculate double integral accordingly.
 - (i) Ans: $\frac{a^4}{3}$
 - (ii) Ans: $\frac{e^4}{2} - 2e$
 - (iii) Ans: $\frac{55}{156}$
 - (iv) Ans: $\frac{-935}{3}$
 - (v) Ans: 6.333
 2. Hints: In change of order of integration, first integrate the integrand with respect to x and then integrate with respect to y under a suitable range.
 - (i) Ans: $\frac{16a^2}{3}$
 - (ii) Ans: $1 - \frac{1}{\sqrt{2}}$
 - (iii) Ans: $\frac{1}{12}(e^{729} - 1)$
 - (iv) Ans: $\frac{1}{16}(17^{1.5} - 1)$
 3. Hints: Using the transformation T find jacobian and ranges of u and v and then integrate with respect to u and v . Ans: $\frac{1}{2}(e - 1)$
 4. (i) Ans: $\frac{-1}{2}$
(ii) Hints: Compute the ranges of u, v after using the transformation. Ans: $-\pi^3$
 5. (i) Hints: Use the transformation $x = 2u$ and $y = 3v$. Ans: 6π
(ii) Hints: Use the transformation $x = \frac{u^2}{v}$ and $y = \frac{v}{u}$. Ans: $\frac{3}{4}$
(iii) Hints: Use the transformation $u = x + y$ and $v = 2x - y$. Ans: $\frac{1}{3}$
 6. Ans: $\frac{16}{3}a^2$
 7. Ans: 16
 8. Ans: $\frac{2}{3}\pi ab(2^{1.5} - 1)$
 9. Ans: 31.6
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