

Math 335-002

Homework #9A * Spring 2015 * Prof. Victor Matveev

Please show all work in detail to receive full credit. Late homework is not accepted.

1. Use polar coordinates to integrate $\iint_D \frac{\ln(x^2 + y^2)}{x^2 + y^2} dx dy$ over a ring domain D defined by $1 \leq x^2 + y^2 \leq 4$. Hint: recall that the Jacobian of polar coordinate system equals r .
2. Calculate the integral $\iint_D \sin(\sqrt{xy}) dx dy$ over a region D enclosed between curves $y=x$, $y=4x$, $xy=1$ and $xy=4$. Use transformation $u = \sqrt{\frac{y}{x}}$, $v = \sqrt{xy}$ (you will see that it makes the Jacobian calculation slightly easier compared to the substitution that we used in class).
3. Find the mass of a hemisphere of radius 1 defined by $x^2 + y^2 + z^2 \leq 1$, $z \geq 0$, if its density is described by the function $\delta(x, y, z) = x^2 z$. Hint: use integration in spherical coordinates.