

DOUBLE INTEGRALS IN POLAR COORDINATES

PRACTICE PROBLEMS

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1. Evaluate $\iint_D y^2 + 3x \, dA$ where D is the region in the 3rd quadrant between $x^2 + y^2 = 1$ and $x^2 + y^2 = 9$.
2. Evaluate $\iint_D \sqrt{1 + 4x^2 + 4y^2} \, dA$ where D is the bottom half of $x^2 + y^2 = 16$.
3. Evaluate $\iint_D 4xy - 7 \, dA$ where D is the portion of $x^2 + y^2 = 2$ in the 1st quadrant.
4. Use a double integral to determine the area of the region that is inside $r = 4 + 2 \sin \theta$ and outside $r = 3 - \sin \theta$.
5. Evaluate the following integral by first converting to an integral in polar coordinates.

$$\int_0^3 \int_{-\sqrt{9-x^2}}^0 e^{x^2+y^2} \, dy \, dx$$

6. Use a double integral to determine the volume of the solid that is inside the cylinder $x^2 + y^2 = 16$, below $z = 2x^2 + 2y^2$ and above the xy -plane.
7. Use a double integral to determine the volume of the solid that is bounded by $z = 8 - x^2 - y^2$ and $z = 3x^2 + 3y^2 - 4$.