Homework 9 — MATH 1586 Spring 2018

We use polar coordinates to describe circular regions for double integration. In this course, any polar coordinates problem will necessarily have "$x^2 + y^2$" in the function being integrated. When converting to polar, you replace all instances of "$x^2 + y^2$" with "r^2" and you replace "$\mathrm{d}A$" with "$r\mathrm{d}r\mathrm{d}\theta$" (not merely $\mathrm{d}r\mathrm{d}\theta$!! This is due to the so-called Jacobian matrix.)

1. Let R be the region defined by the circle of radius 2. Compute $\iint_R x^2 + y^2 \mathrm{d}A$.
2. Let R be the upper semicircle of radius 1. Compute $\iint_R x^2 + y^2 \mathrm{d}A$.
3. Let R be the quarter circle in the first quadrant of radius 3. Compute $\iint_R \sqrt{x^2 + y^2} \mathrm{d}A$.
4. Let R be the annuluar region between the circles of radius 2 and radius 5. Compute $\iint_R x^2 + y^2 \mathrm{d}A$.
5. Let R be defined by the circle of radius 1. Compute $\iint_R (x^2 + y^2)^2 + (x^2 + y^2) \mathrm{d}A$.
6. Let R be defined by the circle of radius 5. Compute $\iint_R e^{x^2+y^2} \mathrm{d}A$.