* 1. **Selection of the area calculation methods based on the algebraic integration**

For regions formed by different types of curves, a suitable selection of area calculation methods is crucial. Generally, in , area of Region is evaluated by a double integral

Regions bounded by 2 functions and bounded by an enclosed parametric curve have different applications of this equation. For regions like , its area is

which is exactly the Eq. 1 used in Part A when evaluating the area of . For parametric curves, Green’s theorem is introduced:

where means integrate on an enclosed curve, and means the boundary of . By letting , there is

Note that this area has direction. If integrate along the curve clockwise, it gives a negative value. Hence, it is either integrated counterclockwise or uses absolute value. Additionally, for an affine transformation , there is

where is the determinant of a matrix , indicating the area scaling factor.