

Show the following statements hold:

1. Evaluate the following double integrals $\iint_U f(x, y) \, dydx$ when:

(a) $U = [0, 10] \times [0, 4]$ and $f = 2x + y^2$.

(b) $U = [0, 2] \times [0, 2]$ and $f = (x + y)^2$.

(c) $U = [-1, 1] \times [-1, 1]$ and $f = \sin(\pi(x + y))$.

(d) U is the region in the (x, y) plane given by:

$$y \geq 0, \ 0 \leq x \leq 2, \ y \leq x^2$$

and $f = x + y$.

(e) U is the finite region in the first quadrant of the (x, y) plane bounded by the line $y = 3x$ and $y = x^2$ and $f = 2x^3 + y^2$.

(f) U is the triangle in the (x, y) plane bounded by the lines $y = x$, $y = -x$, and $y = 2$ and $f = x + y - 2xy$.

2. Find the area of one petal of the curve $r = \sin(3\theta)$