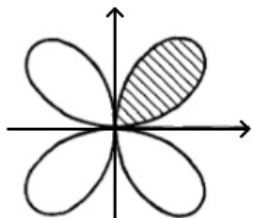


- (15%) Find an equation for the plane tangent to the surface $z = e^{x^2y-1}$ at the point $(1, 1, 1)$.
- (10%) Compute $f(x, y) = y^4 + 2xy^3 + x^2y^2$
 - (5%) the gradient of f at $(0, 1)$;
 - (5%) the directional derivatives at $(0, 1)$ in the direction $(1, 2)$.
- (12%) Let the function $f(x, y) = xy - x^2y - xy^2$. Find (a) critical point(s), and (b) discuss the property of extreme value(including saddle points).
- (12%) Find the distance from $(0, 0)$ to the curve $y = x^2 - \frac{5}{4}$ by using the method of Lagrange multiplier.

5. (15%) Find $\iint_{\Omega} \frac{1}{(1+x+y)^2} dA$, where $\Omega = [0, 2] \times [0, 3]$.

6. (12%) Compute $\int_0^1 \int_{x^{\frac{1}{4}}}^1 \frac{1}{1+y^5} dy dx$.

7. (12%) Let the figure $r = \sin 2\theta$ be as below. Find $\iint_{\Omega} xy dA$, where Ω is a leaf in the first quadrant.



(Hint: $\cos \theta \sin \theta = \frac{\sin 2\theta}{2}$)

8. (12%) Find $\iint_{\Omega} (3x+y)^6 dA$, where Ω is the parallelogram enclosed by $x+y = \pm 1$ and $3x+y = \pm 1$.