

3. (a) **(3 points)** Sketch the domain of the function $f(x, y) = \frac{1}{\sqrt{x^2 - y}}$. Use solid lines for portions of the boundary included in the domain and dashed lines for portions not included.
- (b) **(2 points)** Repeat part (a) for the function $f(x, y) = \sqrt{y^2 - x^2}$.
- (c) **(2 points)** Let $f(x, y, z) = x^2 y^3 \sqrt{z + t}$. Find $f(\sqrt{5}, 2, \pi, 3\pi)$.

4. **(3 points)** Let $f(x, y, z) = xyz + 3$. Find an equation of the level surface that passes through the point (a) $(1, 0, 2)$, (b) $(-2, 4, 1)$, (c) $(0, 0, 0)$.

5. (a) **(2 points)** Compute $\lim_{(x,y) \rightarrow (0,0)} y \ln(x^2 + y^2)$ by changing to polar coordinates.
- (b) **(3 points)** Show that $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{5x^2 - 2y^2}$ does not exist.

6. (a) **(2 points)** Given $w = e^y \cos x$, find $\left. \frac{\partial^3 w}{\partial y^2 \partial x} \right|_{(\pi/4, 0)}$.

- (b) **(3 points)** The total resistance R of two resistances R_1, R_2 connected in parallel is given by $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$. Suppose that R_1, R_2 are measured with a maximum error of 5%. Use differentials to approximate the maximum percentage error in the calculated value of R .