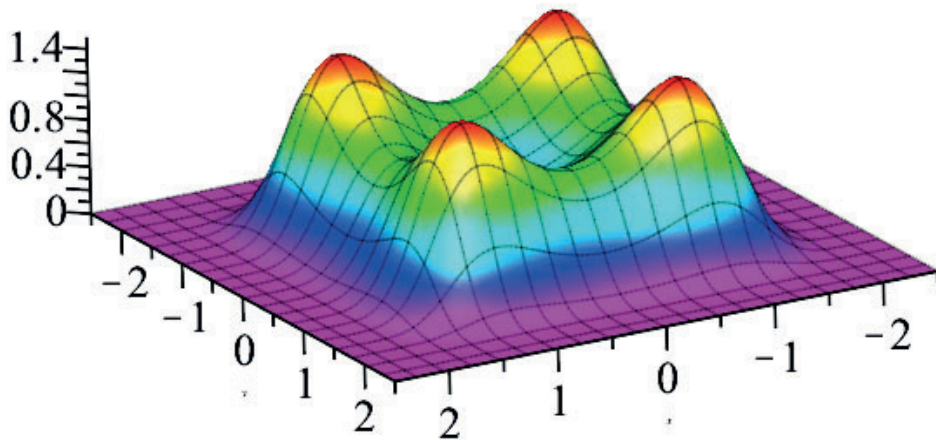


1. [4 pts] Sketch a contour plot (ie level curves) of the following surface. Clearly indicate on your plot the locations of local minima, local maxima and saddle points.



2. [4 pts] Determine if the following limit exists: $\lim_{(x,y) \rightarrow (0,0)} \frac{xy^3}{x^2 + 4y^6}$
3. [4 pts] Find the tangent plane to the surface $z = \ln(xy)$ when $x = 1$ and $y = 1$.

4. [8 pts] Consider the function

$$f(x, y) = \frac{\sqrt{1 - x^2 - y^2}}{x^2}$$

and let D be its domain.

- (a) Find and sketch D .
- (b) Is the domain open, closed or neither?
- (c) Does the function have an absolute minimum on D ? If so, then find it. If not, explain why not.
- (d) Does the function have an absolute maximum on D ? If so, then find it. If not, explain why not.

5. [6 pts] Let C be the curve with parametric equation $\mathbf{r}(t) = \langle 1 + t^2, 2 + 2t^2 \rangle$, for $-1 \leq t \leq 1$.

- (a) What shape is the curve?
- (b) Find the arc length of C .

6. [bonus 4 pts] Propose a function $f(x, y)$ whose graph is the surface in question 1.