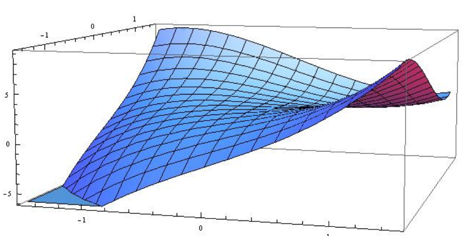
1. Find the local maximum and minimum values and saddle point(s) of the function.

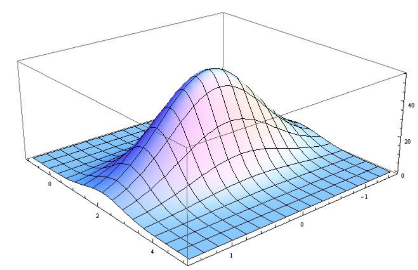
a) $f(x, y) = x^3 + y^3 - 3xy + 2$

A. f has a local minimum value 1 at $(1, 1)$ and $(0, 0)$ is a saddle point.

b) $f(x, y) = e^{4y - x^2 - y^2}$

A. f has a local maximum value e^4 at $(0, 2)$.



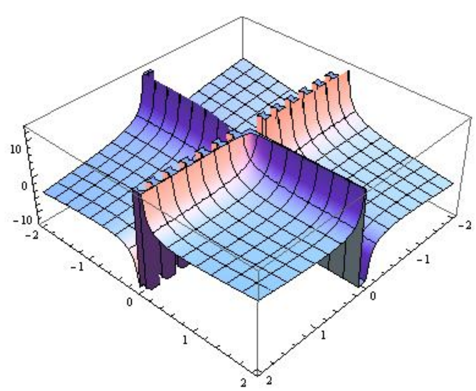


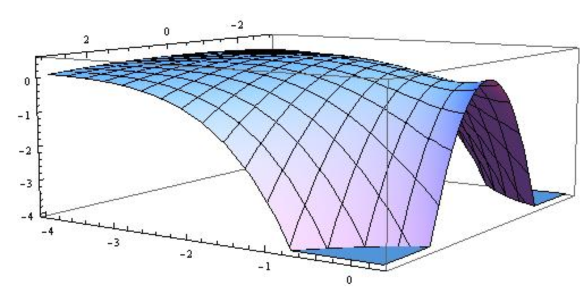
c) $f(x, y) = xy + \frac{1}{x} + \frac{1}{y}$

A. f has a local minimum value 3 at $(1, 1)$.

d) $f(x, y) = e^y(y^2 - x^2)$

A. f has a local maximum value $\frac{4}{e^2}$ at $(0, -2)$ and $(0, 0)$ is a saddle point.





2. a) Find the point on the plane $x - y + z = 4$ that is closest to the point $(1, 2, 3)$.

A. $(\frac{5}{3}, \frac{4}{3}, \frac{11}{3})$

b) Find the points on the surface $y^2 = 9 + xz$ that are closest to the origin.

A. $(0, 3, 0)$ and $(0, -3, 0)$

3. Find the absolute maximum and minimum values of f on the set D.

$$f(x, y) = 3 + xy - x - 2y,$$

D is the closed triangular region with vertices $(1, 0)$, $(5, 0)$, and $(1, 4)$.

A. Absolute maximum : 2, Absolute minimum : -2.

4. Use Lagrange multipliers to find the maximum and minimum values of the function subject to the given constraint(s).

a) $f(x, y, z) = 2x + 6y + 10z$; $x^2 + y^2 + z^2 = 35$

A. Max : 70, Min : -70

b) $f(x, y, z) = x^2y^2z^2$; $x^2 + y^2 + z^2 = 1$

A. Max : $\frac{1}{27}$, Min : 0

c) $f(x, y, z) = 3x - y - 3z$; $x + y - z = 0$, $x^2 + 2z^2 = 1$

A. Max : $\frac{2\sqrt{6}}{3}$, Min : $-\frac{2\sqrt{6}}{3}$

Course Homework due Mar 12, Wed.

Mar 3, Mon. : **14.7** 1, 3, 5, 7, 9, 11, 29, 31, 39
Mar 5, Wed. : **14.8** 3, 5, 7, 9, 11, 15, 19, 25, 41
Mar 7, Fri. : **15.1** 11, 31. **15.2** 3, 5, 7, 9, 15, 17, 27, 31