Two Variable Functions

- 1 variable function
  \[ f(x) = e^x + x^2 \cos(x) \]
  \[ f(0) = 1 \]

- A variable functions
  \[ f(x, y) = e^{-y} + xy^3 \cos(x + y) \]
  \[ f(0, 0) = f(0, 0) = 1 \]
  \[ f(\pi, 0) = f(\pi, 0) = 1 \]
  \[ f(1, \pi) = f(1, \pi) = e^{-\pi} + \pi^3 \cos(1 + \pi) \]

* plug 2 variables → get 1 value *

Examples:
1) \[ f(x, y) = x^2 + y^2 \]
   * both → negative parabola w/ max *

2) \[ f(x, y) = x^2 - y^2 \]
   \[ \text{new type of critical point} \]
   \[ \text{saddle point} \]

\[ (x, y) \]

\[ z = f(x, y) \]
\[ (0, 0, 1) \]
\[ (1, 0) \]
\[ (0, 0) \]
\[ (x, y) \]
\[ z = f(x) \]
\[ (0, 1) \]
\[ \text{graph of } f(x) \]
\[ \text{surface} \]
\[ \text{graph of } f(x, y) \]
\[ \text{parabola} \]
\[ \text{saddle} \]
\[ \text{not max or min / saddle point still critical point} \]