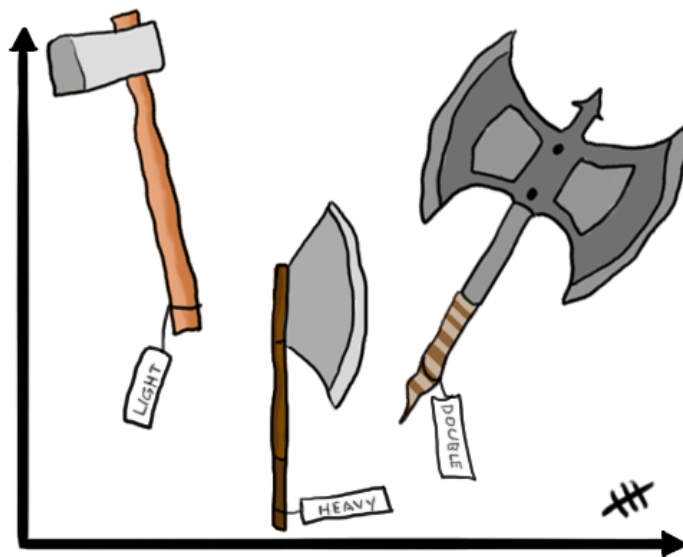


### Homework 34: multivariable functions

For your *Mathematica* work, please label each part with the associated problem and part numbers to make it easier for the grader to find your work.

- (1) Plot the function  $z(x, y) = x^3 + 1$  by hand. Label your axes (as in the plural of *axis*, not the plural of *ax*). [Hint: start with a 2D plot, then go to 3D.]

### Always label your axes



- (2) Consider the function  $f(x, y) = x^2 + (y - 1)^2$ .
- On a single graph, draw (by hand) the slices with  $x$  fixed at  $x = -1, 0,$  and  $1$ . Label the axes and graphs appropriately (same for part (b) below).
  - On a single graph, draw (by hand) the slices with  $y$  fixed at  $y = -1, 0,$  and  $1$ .
  - Plot the graph of  $f(x, y)$  on *Mathematica* using both `ContourPlot` and `Plot3D`. Change the `ViewPoint` to get different views of the plot. Explain how your hand-drawn graphs agree with your *Mathematica*-drawn plots.
- (3) Consider a vibrating guitar string. The displacement of the string from its resting position is given by

$$g(x, t) = \cos 2t \sin x$$

where  $0 \leq t \leq \pi$  is time in milliseconds and  $0 \leq x \leq \pi$  is the distance from the end of the string. Do all of the steps below using *Mathematica* to come to an understanding of the shape of the graph.

- Plot, on a single `Plot`, the slices when  $x = 0, \pi/4,$  and  $\pi/2$ . Label the slices by hand or use *Mathematica*'s drawing tools (same for part (b) below).
- Plot, on a single `Plot`, the slices when  $t = 0, \pi/2,$  and  $\pi$ .
- Plot with `ContourPlot` and `Plot3D`.