Calculus III
Lab #3: Cylindrical and Quadric Surfaces

To graph cylindrical surfaces, use the ParametricPlot3D Mathematica function. To graph the cylindrical surface \( y = x^2 \) (note the missing z variable), do the following:

```mathematica
x[t_] := t;
y[t_] := t^2;
z[t_] := s;
pl = ParametricPlot3D[{x[t], y[t], z[t]}, {t, -2, 2}, {s, -2, 2}, AxesLabel -> {x, y, z}];
```

![Graph of the cylindrical surface](image)
Please note how the graph travels parallel to the z-axis. To plot a quadric surface use the Plot3D function as illustrated when plotting $z = \sqrt{x^2 + y^2}$:

```mathematica
f[x_, y_] := \sqrt{x^2 + y^2};
p2 = Plot3D[f[x, y], {x, -2, 2}, {y, -2, 2}, AxesLabel -> {x, y, z}];
```

To show two or more plots in the same graph, use the Show function:

```mathematica
Show[p1, p2];
```
Exercises

1. Plot \( y = \sin(x) \) and \( x = \sin(y) \) from \(-\pi\) to \(\pi\) separately and then together.

2. Plot \( z = 8 - x^2 - y^2 \) and \( z = x^2 + y^2 \) together.

3. Define and plot two intersecting planes.

4. Define at least two surfaces of your choice and plot them together.