

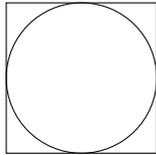
# Tikz Worksheet

Include the package: `\usepackage{pgfplots}`

Tikz pictures are in the environment: `\begin{tikzpicture} ... \end{tikzpicture}`

## Lines and Circles

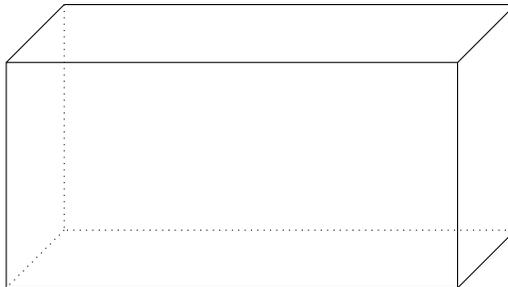
- a line from (1,1) to (3,3): `\draw (1,1) -- (3,3);`
- two lines after each other: `\draw (1,1) -- (3,3) -- (4,2);`
- a circle with center (1,1) and radius 2: `\draw (1,1) circle (2);`



Draw the following picture:

## 3 dimensional

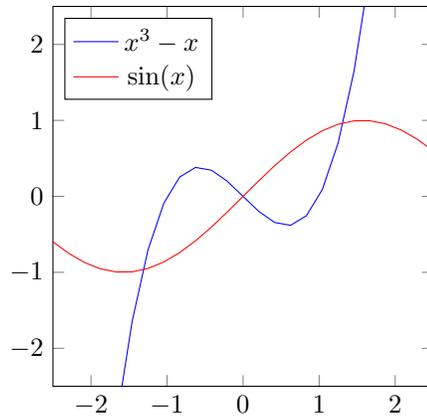
- Use three dimensional points, e.g. (3,1,0)
- For different line styles, e.g.: `\draw[dotted]` or `\draw[dashed]`
- For different line thickness, e.g.: `\draw[thick]` or `\draw[thin]`
- You can combine line style and thickness, e.g.: `\draw[thick,dotted]`



Draw the following picture:

## Functions

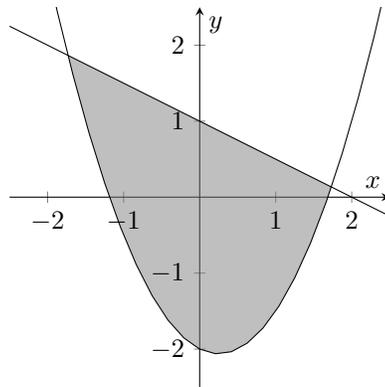
- Use the `axis` environment inside the `tikzpicture` environment.
- To draw a function: `\addplot {2*x};`
- Range of  $x$ - and  $y$ -values: The `axis` environment takes options, e.g.: `\begin{axis} [xmin=-2.5,xmax=2.5,ymin=-2.5,ymax=2.5,]`
- After each plotted function add a legend entry for it, e.g.: `\addlegendentry{2x}`
- To position the legend, add the following as an option in the `axis` environment: `legend pos=north west,`



Draw the following graph:

### Shaded area

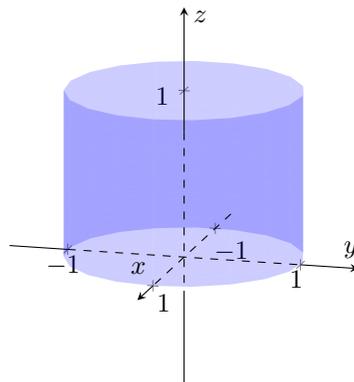
- Include the tikzlibrary: `\usepgfplotslibrary{fillbetween}`
- Give each function a name, for that add the option `name path=F` to `\addplot[...]`
- To fill the area between the two graphs: `\addplot[color=gray,fill=gray,fill opacity=0.5] fill between [of=F and G, soft clip={domain=-1:2.5}]`;



Draw the following graph:

### 3 dimensional surfaces

- Draw a surface: `\addplot3[surf,opacity=0,color=blue,fill opacity=0.2,z buffer=sort,domain=0:2*pi,y domain=0:1,samples=20] ({cos(deg(x))*sin(deg(y))},{sin(deg(x))*sin(deg(y))},{cos(deg(y))})`;
- To make part of the axis dashed, make the axis disappear `axis line style={draw=none}` and then draw them by hand



Draw the following graph: