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);

![Circle](image)

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]

![3D Cube](image)

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}]`;

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: