目录

1 函数绘制

1.1 绘制二维函数图像

如下图，绘制函数图像

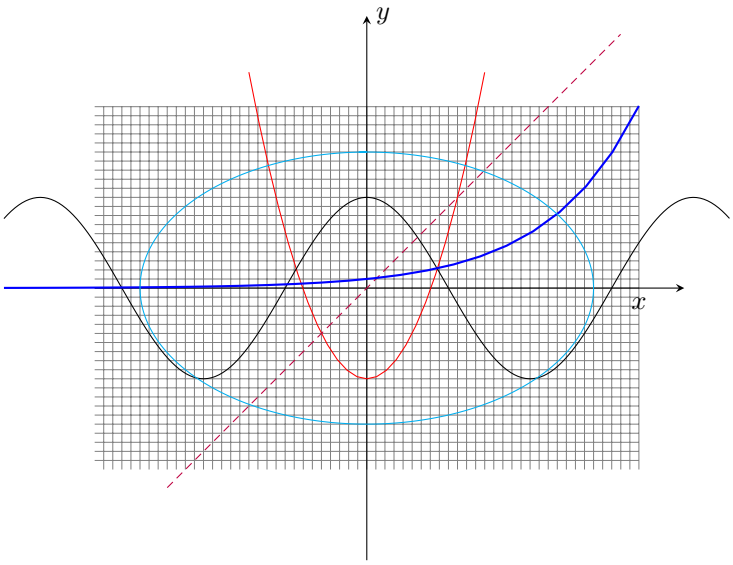
$y = 2x^2 - 1$

$y = x$

$y = \sin(x)$

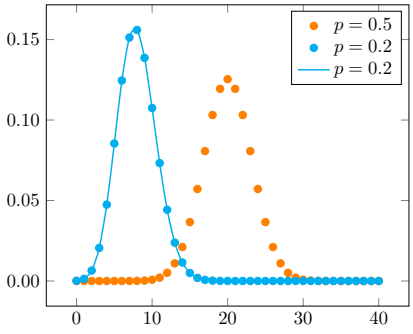
$y = e^x$

$$\begin{cases} x = 2.5\sin(t) \\ y = 1.5\cos(t) \end{cases}$$



1.2 自定义函数

```
\tikzset{
    declare function={
    binom(\k,\n,\p)=
        \n!/(\k!*(\n-\k)!)*\p^\k*(1-\p)^(\n-\k);
        }
    }
\begin{tikzpicture}[scale=0.7]
    \begin{axis}[samples at={0,...,40},
            yticklabel style={
            /pgf/number format/fixed,
            /pgf/number format/fixed zerofill,
            /pgf/number format/precision=2}
        ]
    \addplot [only marks,orange] {binom(x,40,0.5)};
    \addlegendentry{$p=0.5$}
    \addplot [only marks,cyan] {binom(x,40,0.2)};
    \addlegendentry{$p=0.2$}
    \addplot [smooth,thick,cyan] {binom(x,40,0.2)};
    \addlegendentry{$p=0.2$}
    \end{axis}
\end{tikzpicture}
```

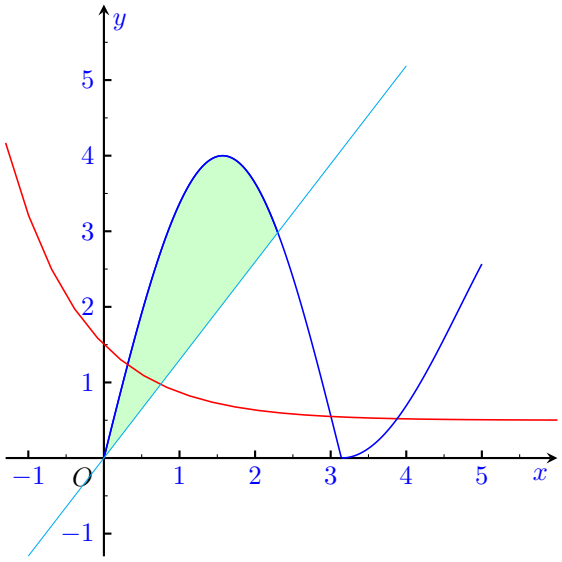


- help lines: 显示背景网格辅助线
- step：domain 区间内 step 参数控制网格大小

- domain: 函数的绘制区间

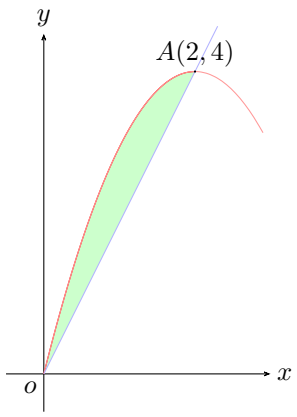
1.3 使用自定义的坐标轴绘图

```
\begin{tikzpicture}{smooth}
% 1. 标记重要的点
\coordinate (O) at (0, 0);
\coordinate (ymax) at (0, 6);
\coordinate (ymin) at (0, -1.3);
\coordinate (xmax) at (6, 0);
\coordinate (xmin) at (-1.3, 0);

% 2. 绘制基本的坐标轴
\draw[-stealth, thick] (ymin) -- (ymax);
\draw[-stealth, thick] (xmin) -- (xmax);
\node[blue, right=6pt, below] at (ymax) {$y$};
\node[blue, below=6pt, left] at (xmax) {$x$};

% 3. 给x, y轴加上刻度
\node[black, left=8pt, below] at (O) {$O$};
\draw[black] (0, 0.5) -- (0.05, 0.5);
\draw[black] (0.5, 0) -- ( 0.5, 0.05);
\foreach \loc/\x in
    {-1/-1, 1/1, 2/2, 3/3, 4/4, 5/5}
    {\node[blue, below] at (\loc, 0) {$\x$};
     \draw[black, thick] (\loc, 0) -- (\loc, 0.1);
     \draw[black] (\loc+0.5, 0) -- (\loc+0.5, 0.05);
    }
\foreach \loc/\y in
    {-1/-1, 1/1, 2/2, 3/3, 4/4, 5/5}
    {\node[blue, left] at (0, \loc) {$\y$};
     \draw[black, thick] (0, \loc) -- (0.1, \loc);
     \draw[black] (0, \loc+0.5) -- (0.05, \loc+0.5);
    }
% 4. 绘制函数图
% 使用deg让它认识弧度制
\draw[blue, semithick, domain=0:2.3, fill=green!20][samples=200] plot (\x, {4*sin(deg(\x))});
\draw[blue, semithick, domain=0:pi][samples=200] plot (\x, {4*sin(deg(\x))});
\draw[red, semithick,  domain=-1.3:6] plot(\x, {exp(-\x)+0.5});
\draw[cyan, domain=-1:4] plot(\x,{4*sin(deg(2.3))/2.3*\x});
\draw[blue, semithick, domain=pi:5][samples=200] plot (\x, {2*sin(deg(\x + pi/2))+2});
% \draw [domain=0:1.7, black] (1.7, sin(deg(1.7))) -- (1.7, 0);
% \draw [fill =green!30]
\end{tikzpicture}
```

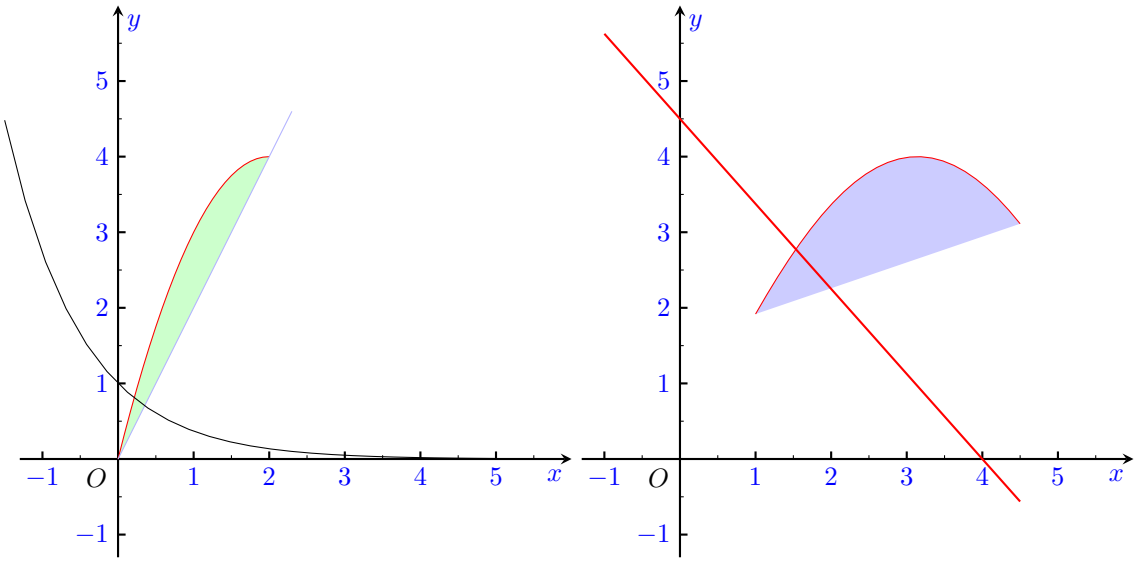


1.4 函数阴影的填充

```
\begin{tikzpicture}[smooth]
    \draw[arrows={-Stealth[length=5pt, inset=3.5pt]}]
        (-0.5,0) -- (3.0,0)
        node (xaxis) [right=-1pt] {$x$};
    \draw[arrows={-Stealth[length=5pt, inset=3.5pt]}]
        (0,-0.5) -- (0,4.5)
        node (yaxis) [above=-0.6pt] {$y$};
    \draw  (-0.18,-0.18) node {$o$};
    \draw[color=red,domain=0:2.0,fill=green!20]
        plot (\x,4*\x-\x*\x);
    \draw[color=red!40,domain=0:2.90]
        plot (\x,4*\x-\x*\x)  ;
    \draw[color=blue!30,domain=0:2.3]
        plot (\x,2*\x)  ;
    \draw[fill=black]
        (2,4) circle [radius=0.2pt]
        node[above=-1.8pt] {$A(2,4)$};
\end{tikzpicture}
```

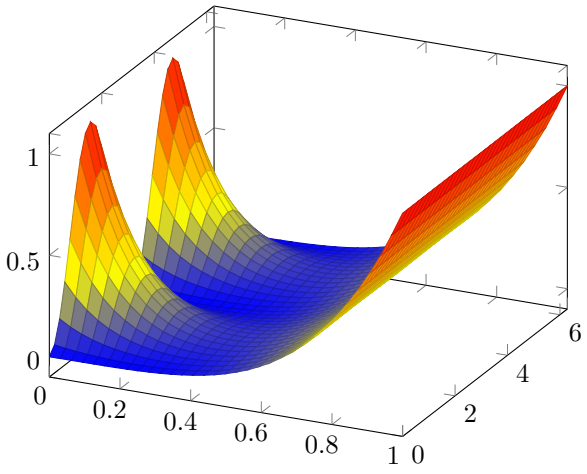


1.5 封装绘图函数框架



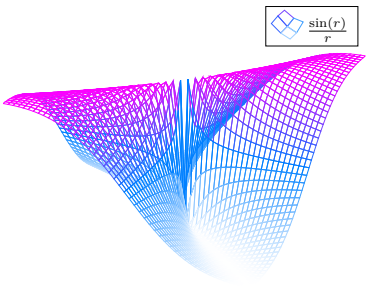
2 内置绘图命令

2.1 数据绘图

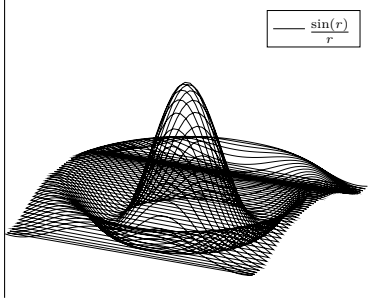


2.2 三维曲面绘制

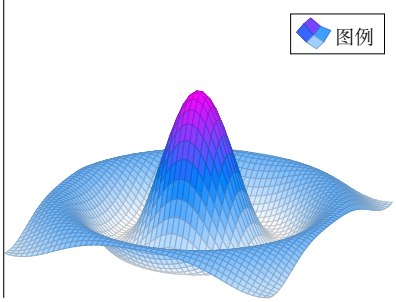
mesh



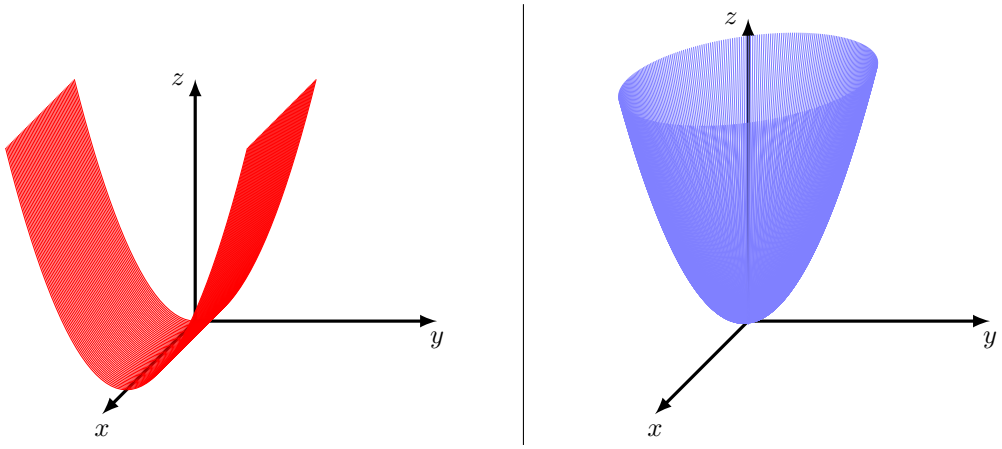
default



surf

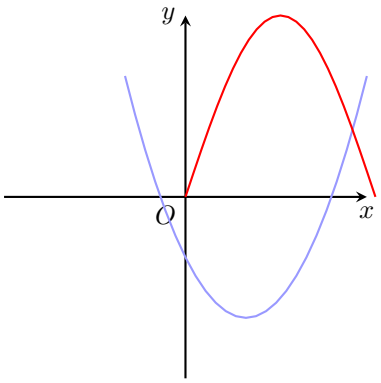


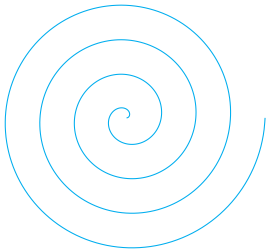
2.3 TikZ 中旋转与平移

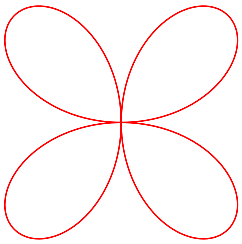


3 命令封装

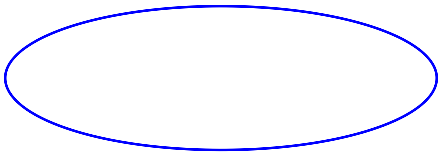
3.1 极坐标图形绘制

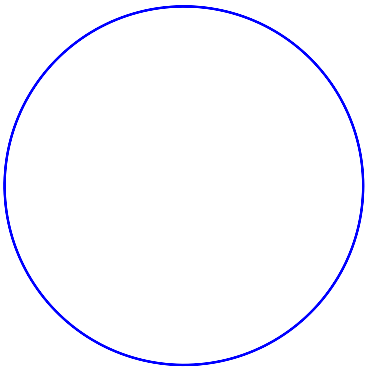






3.2 二维参数方程





3.3 三维参数方程