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1、用Matlab命令函数分别绘出抽样信号、矩形脉冲信号、周期矩形脉冲信号、三角波脉冲信号、三角波周期信号的波形，理解其中参数的意义。

**1）抽样信号：**

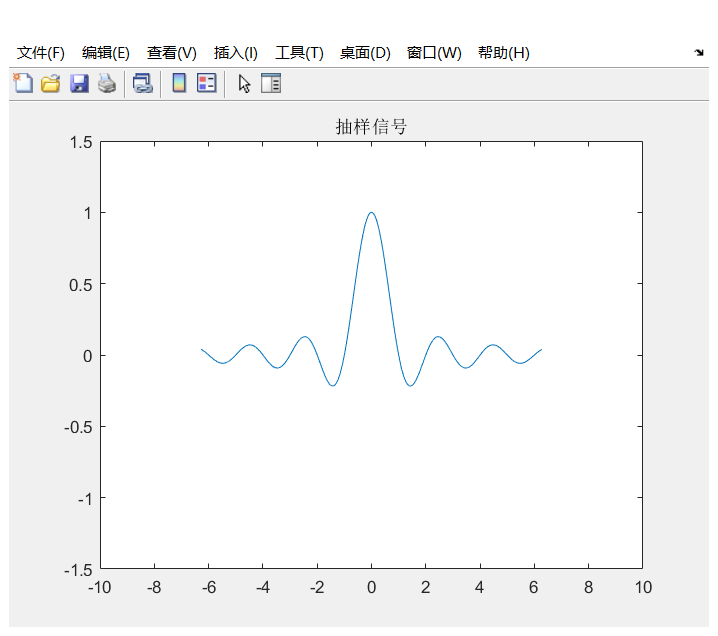
源码：

|  |
| --- |
| t = -2\*pi:0.01:2\*pi;    f\_sinc = sinc(t);    plot(t,f\_sinc);  title('抽样信号');  axis([-10,10,-1.5,1.5]); |

各参数意义：

|  |  |
| --- | --- |
| 函数 | 参数 |
| plot(t,f\_sinc) | t为自变量，f\_sinc为因变量 |
| axis(a,b,c,d) | a,b 自变量区间 c,d 因变量区间 |

运行结果：



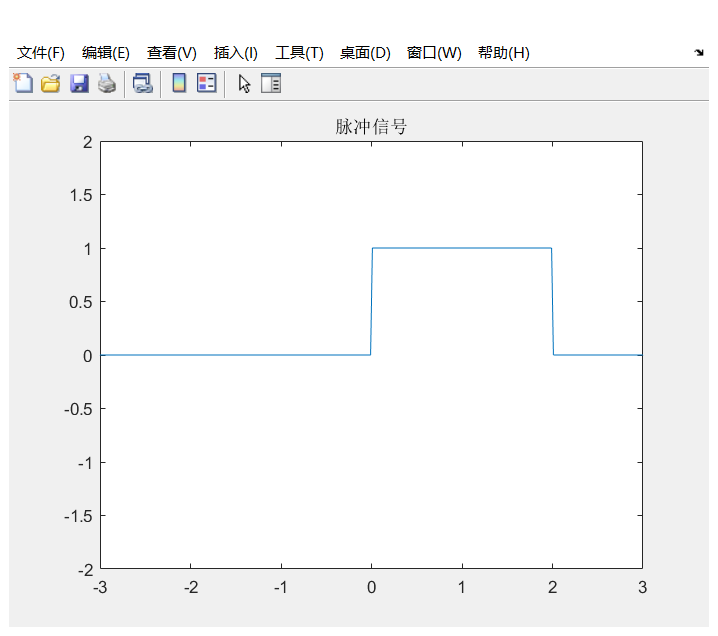
**2）矩形脉冲信号：**

源码：

|  |
| --- |
| t = -5:0.01:5;  f\_sign = sign(t);    f\_u = 1/2\*f\_sign + 1/2;    f\_sign2 = sign(t-2);    f\_u2 = 1/2\*f\_sign2 + 1/2;    f\_wave = f\_u - f\_u2;    plot(t,f\_wave);    axis([-3,3,-2,2]);  title('脉冲信号'); |

各参数意义：

|  |  |
| --- | --- |
| 函数 | 参数 |
| plot(t,f\_sinc) | t为自变量，f\_sinc为因变量 |
| axis(a,b,c,d) | a,b 自变量区间 c,d 因变量区间 |

运行结果：

**3）周期脉冲信号：**

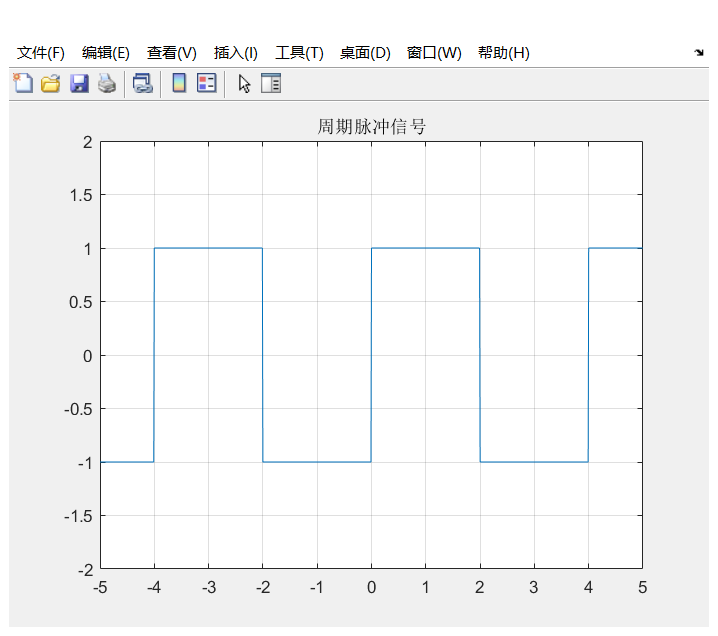
源码：

|  |
| --- |
| t = -5:0.01:5;  f = square(0.5\*pi\*t,50);    plot(t,f);    axis([-5,5,-2,2]);    title('周期脉冲信号');  grid on; |

各参数意义：

|  |  |
| --- | --- |
| 函数 | 参数 |
| sqare(a,b) | a为角频率，b为占空比 |
| grid on | 显示网格线 |

运行结果：



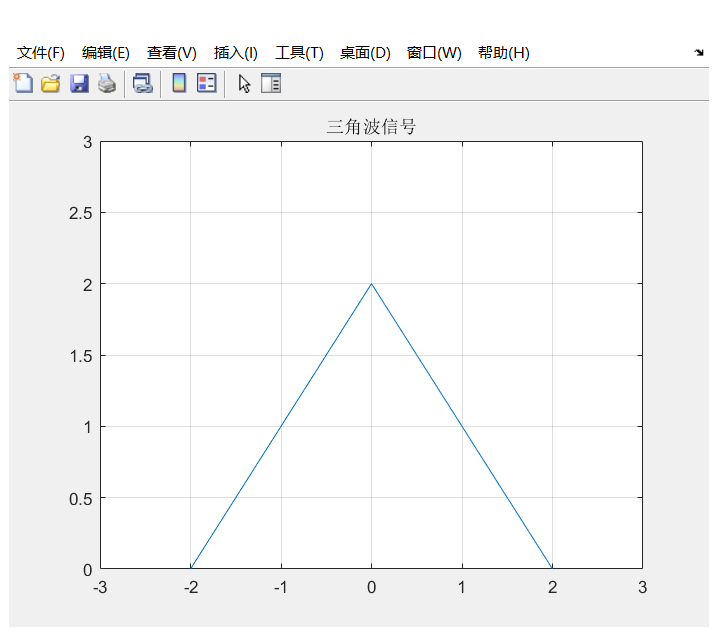
**4）三角波信号：**

源码：

|  |
| --- |
| t = -2:0.01:2;  f\_u1 = 0.5\*sign(t) + 0.5;  f\_u2 = 0.5\*sign(-1\*t)+0.5;  y = f\_u2.\*(t+2)+f\_u1.\*(-1\*t+2);    plot(t,y);    axis([-3,3,0,3]);  title('三角波信号 ');  grid on; |

各参数意义：

|  |  |
| --- | --- |
| 函数 | 参数 |
| plot(t,f\_sinc) | t为自变量，f\_sinc为因变量 |
| grid on | 显示网格线 |

运行结果：

**5）抽样信号：**

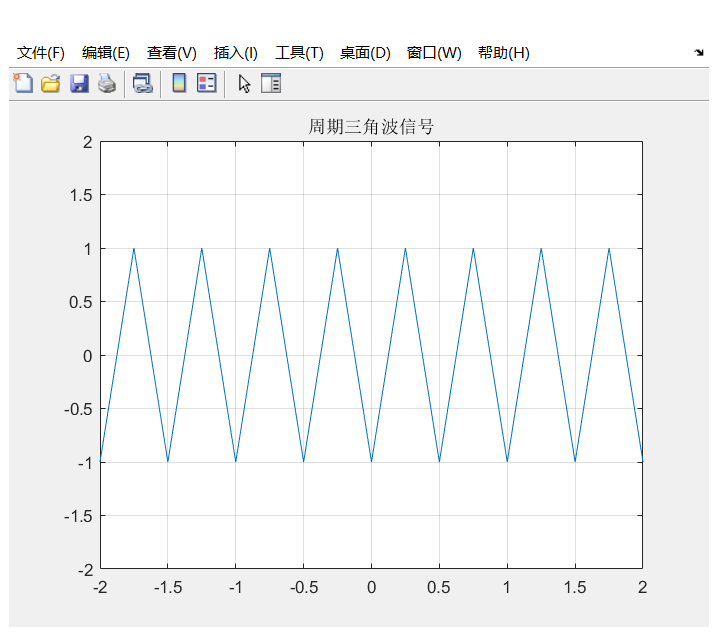
源码：

|  |
| --- |
| t = -2:0.01:2;  f = sawtooth(4\*pi\*t,0.5);    plot(t,f);  axis([-2,2,-2,2]);  title('周期三角波');  grid on; |

各参数意义：

|  |  |
| --- | --- |
| 函数 | 参数 |
| plot(t,f\_sinc) | t为自变量，f\_sinc为因变量 |
| sawtooth(a\*t,x) | 生成周期为2pi/a , 峰值出现在x（0~1，0.5为中央）的三角波 |

运行结果：



2、分别用MATLAB的数字运算和符号运算功能，绘出下列连续时间信号的波形。

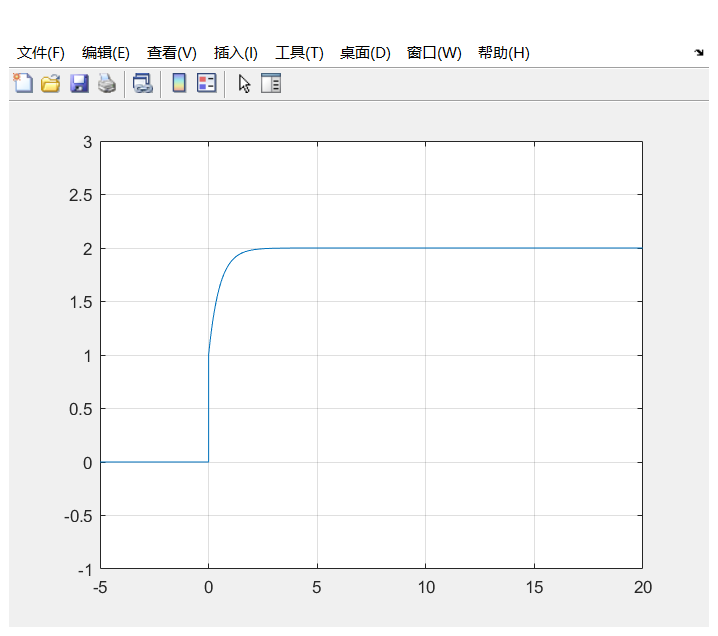
**1）**

**法一：符号法**

源码：

|  |
| --- |
| t = sym('t');  f = (2-exp(-2\*t))\*heaviside(t);  fplot(f,[-5,20]);  axis([-5,20,-1,3]);  grid on; |

运行结果：

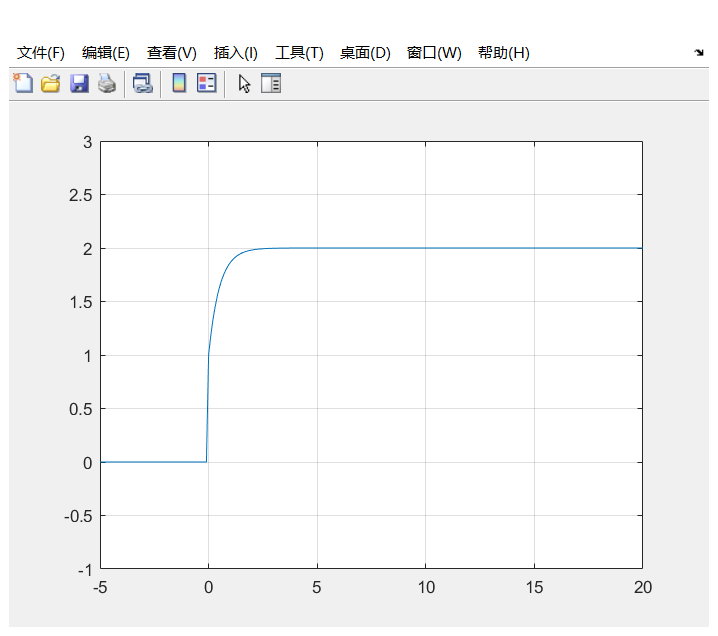


**法二：数值法**

源码：

|  |
| --- |
| t = -5:0.1:20;  f = (2-exp(-2\*t)).\*stepfun(t,0);  plot(t,f);  axis([-5,20,-1,3]);  grid on; |

运行结果：



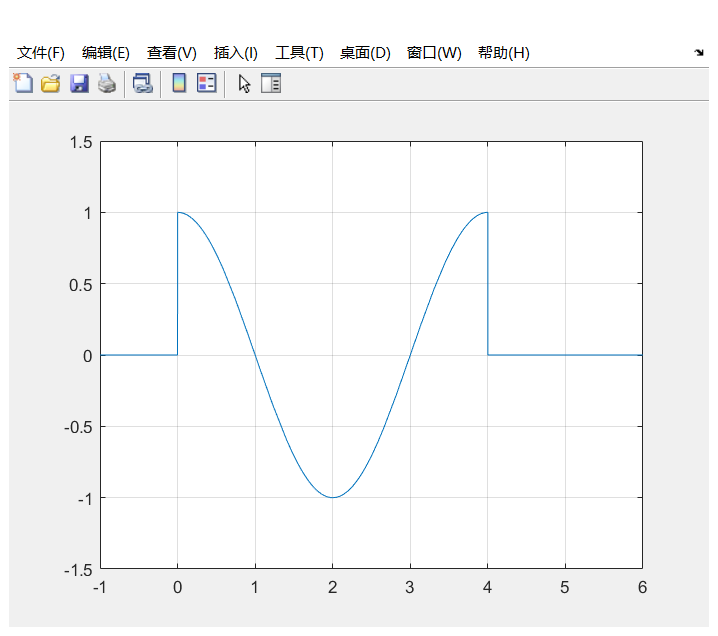
**2）**

**法一：符号法**

源码：

|  |
| --- |
| t = sym('t');  f = cos(0.5\*pi\*t)\*(heaviside(t)-heaviside(t-4));  fplot(f,[-1,6]);  axis([-1,6,-1.5,1.5]);  grid on; |

运行结果：

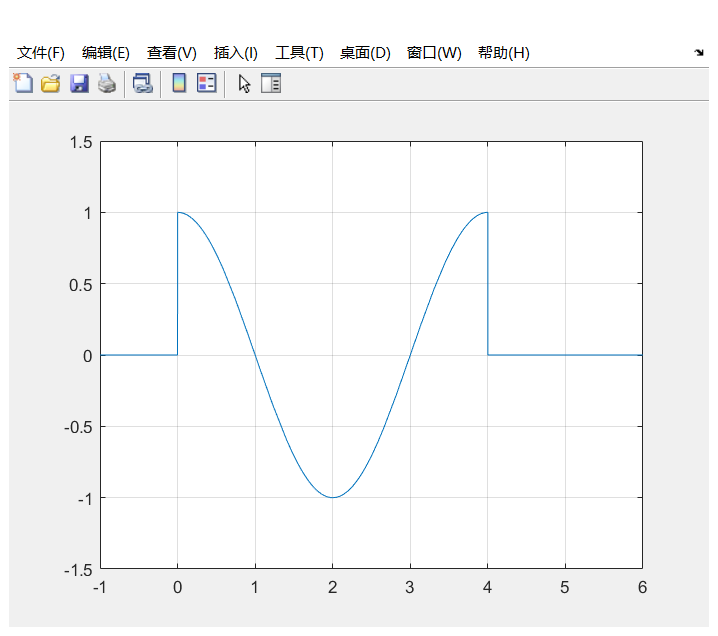


**法二：数值法**

源码：

|  |
| --- |
| t = -1:0.1:6;  f = cos(0.5\*pi\*t).\*(stepfun(t,0)-stepfun(t,4));  plot(t,f);  axis([-1,6,-1.5,1.5]);  grid on; |

运行结果：



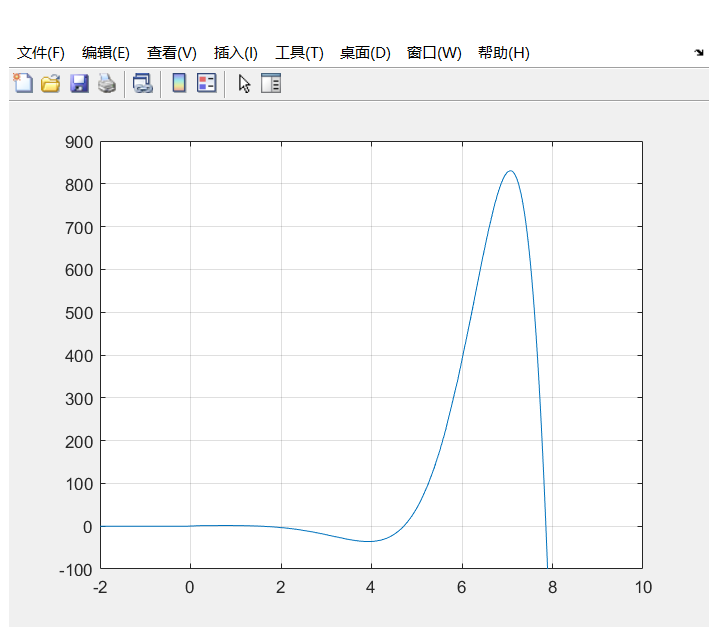
**3）**

**法一：符号法**

源码：

|  |
| --- |
| t = sym('t');  f = exp(t)\*cos(t)\*heaviside(t);  fplot(f,[-2,10]);  axis([-2,10,-100,900]);  grid on; |

运行结果：

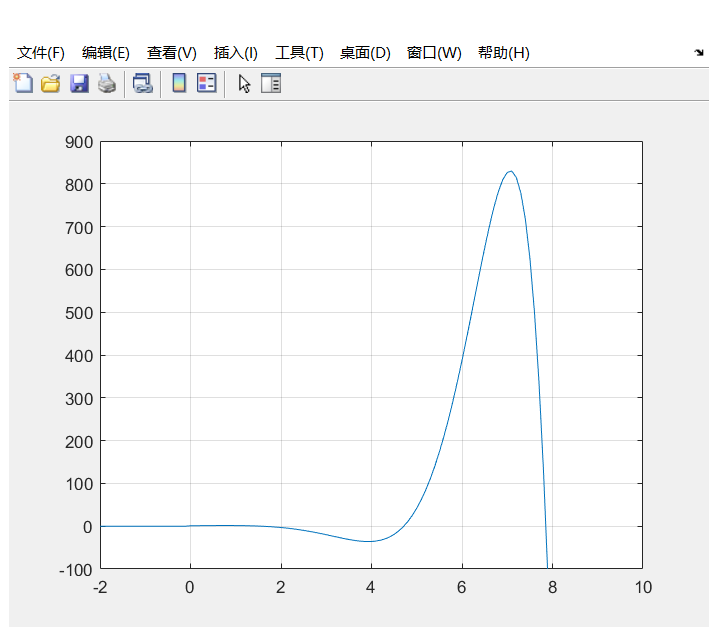


**法二：数值法**

源码：

|  |
| --- |
| t = -2:0.1:10;  f = exp(t).\*cos(t).\*stepfun(t,0);  plot(t,f);  axis([-2,10,-100,900]);  grid on; |

运行结果：



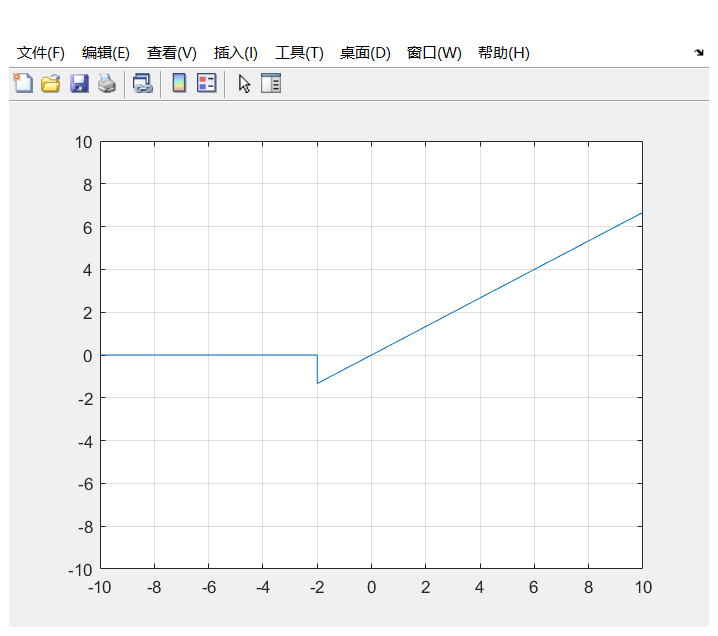
**4）**

**法一：符号法**

源码：

|  |
| --- |
| t = sym('t');  f = (2/3)\*t\*heaviside(t+2);  fplot(f,[-10,10]);  axis([-10,10,-10,10]);  grid on; |

运行结果：

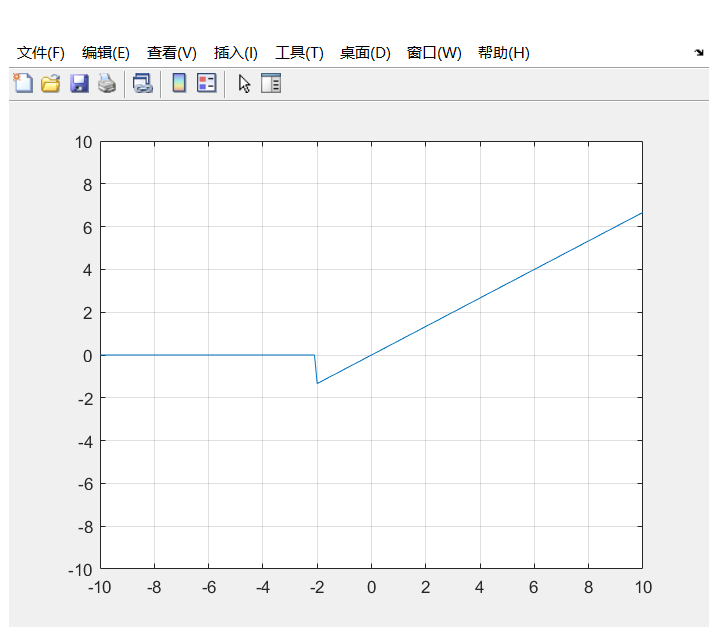


**法二：数值法**

源码：

|  |
| --- |
| t = -10:0.1:10;  f = (2/3)\*t.\*stepfun(t,-2);  plot(t,f);  axis([-10,10,-10,10]);  grid on; |

运行结果：



3、已知信号的波形如右图所示，绘出满足下列要求的信号波形。

**f(t)**

**t**

**2**

**2**

**1**

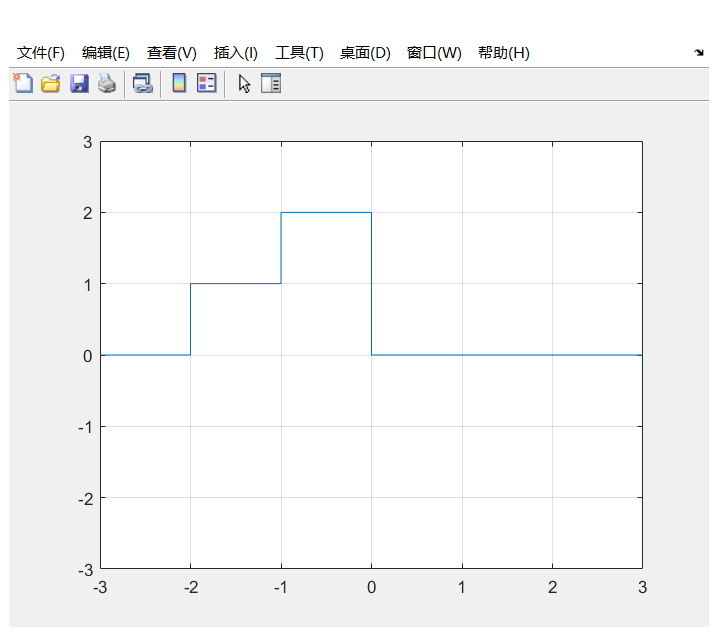
**1**

**1）**

源码：

|  |
| --- |
| t = sym('t');  ft = 2\*heaviside(-t)-1\*heaviside(-t-1)-1\*heaviside(-t-2);  fplot(ft,[-3,3]);  axis([-3,3,-3,3]);  grid on; |

运行结果

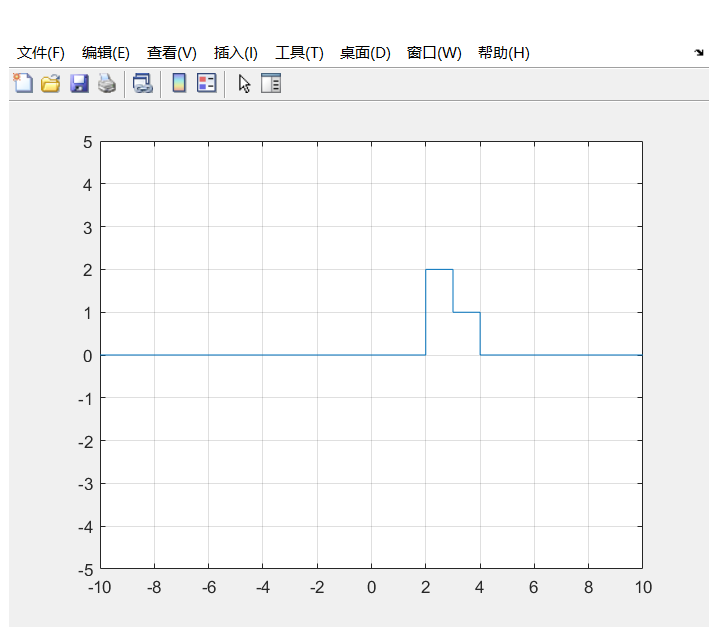


**2）**

源码：

|  |
| --- |
| t = sym('t');  ft = 2\*heaviside(t-2)-1\*heaviside(t-1-2)-1\*heaviside(t-2-2);  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

运行结果

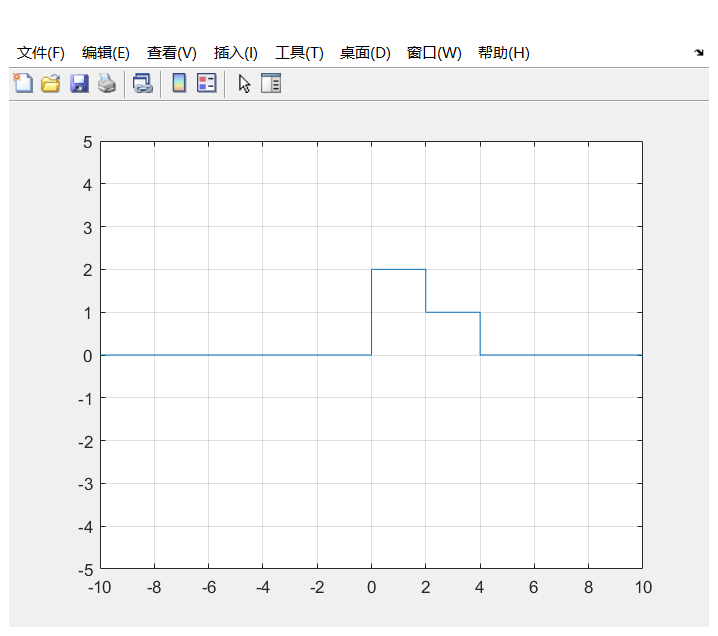


**a = 0.5**

源码：

|  |
| --- |
| t = sym('t');  a = 0.5;  ft = 2\*heaviside(a\*t)-1\*heaviside(a\*t-1)-1\*heaviside(a\*t-2);  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

运行结果

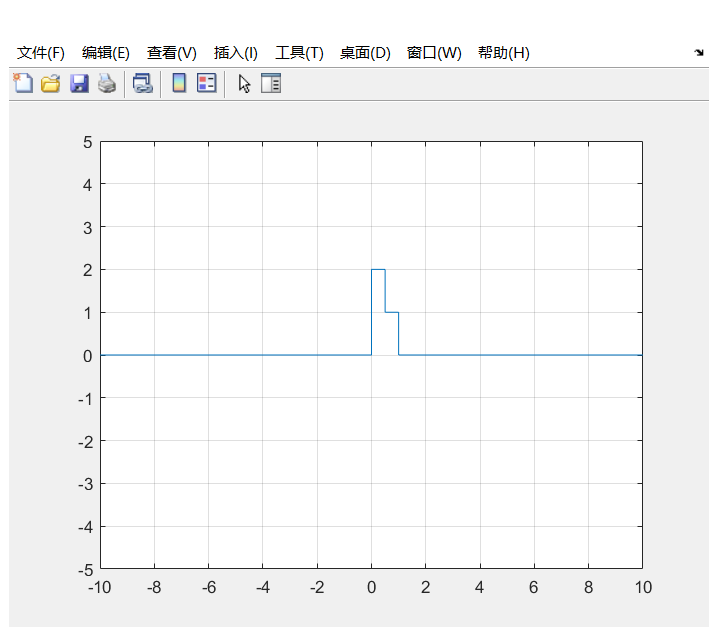
****

**a=2**

源码：

|  |
| --- |
| t = sym('t');  a = 2;  ft = 2\*heaviside(a\*t)-1\*heaviside(a\*t-1)-1\*heaviside(a\*t-2);  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

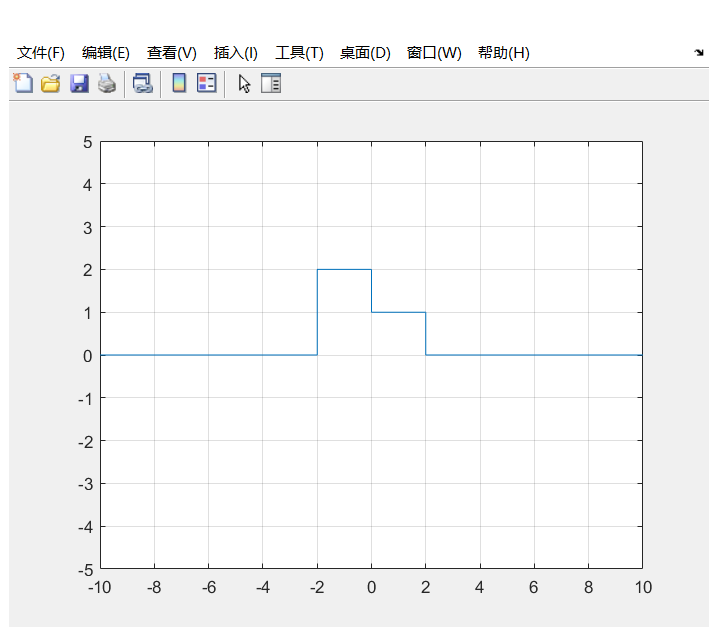
运行结果

****

源码：

|  |
| --- |
| t = sym('t');  a = 0.5;  ft = 2\*heaviside(a\*t+1)-1\*heaviside(a\*t+1-1)-1\*heaviside(a\*t+1-2);  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

运行结果



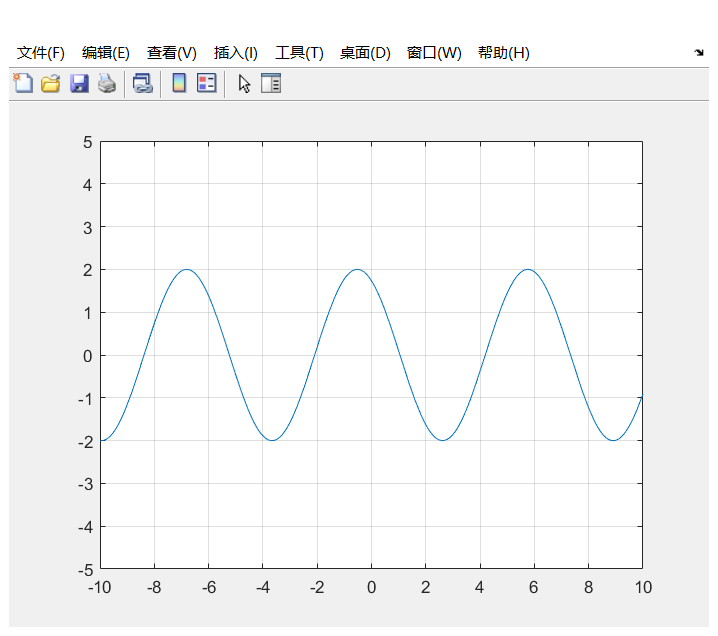
4、利用Matlab画出复信号的实部、虚部、模和辅角。

**实部：**

源码：

|  |
| --- |
| t = sym('t');  ft = real(2\*exp(1i\*(t+pi/6)));  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

运行结果

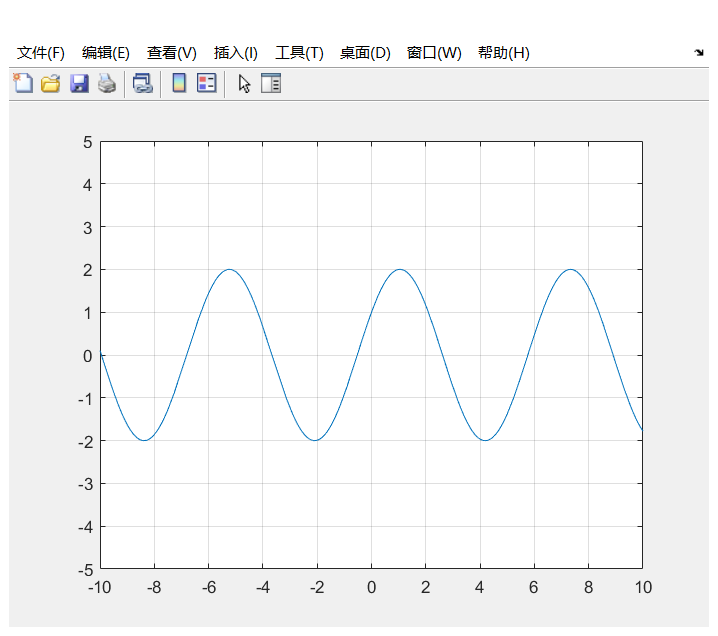
****

**虚部：**

源码：

|  |
| --- |
| t = sym('t');  ft = imag(2\*exp(1i\*(t+pi/6)));  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

运行结果

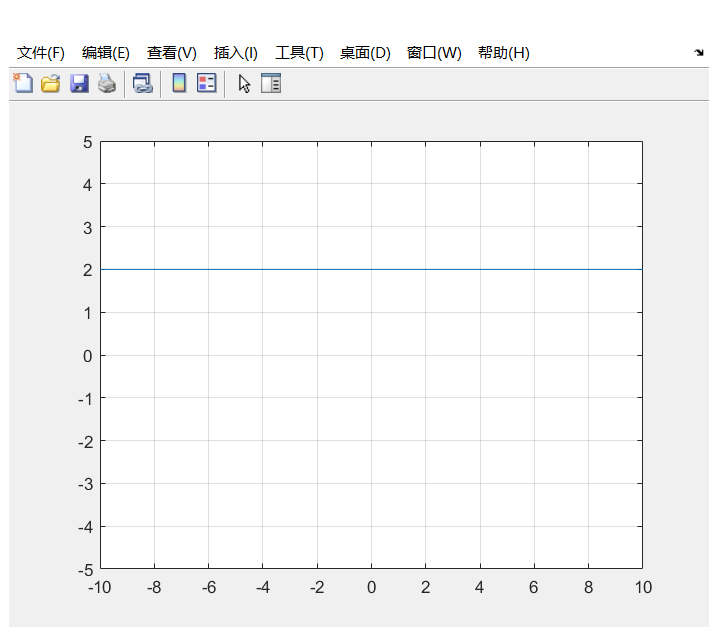
****

**模：**

源码：

|  |
| --- |
| t = sym('t');  ft = abs(2\*exp(1i\*(t+pi/6)));  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

运行结果

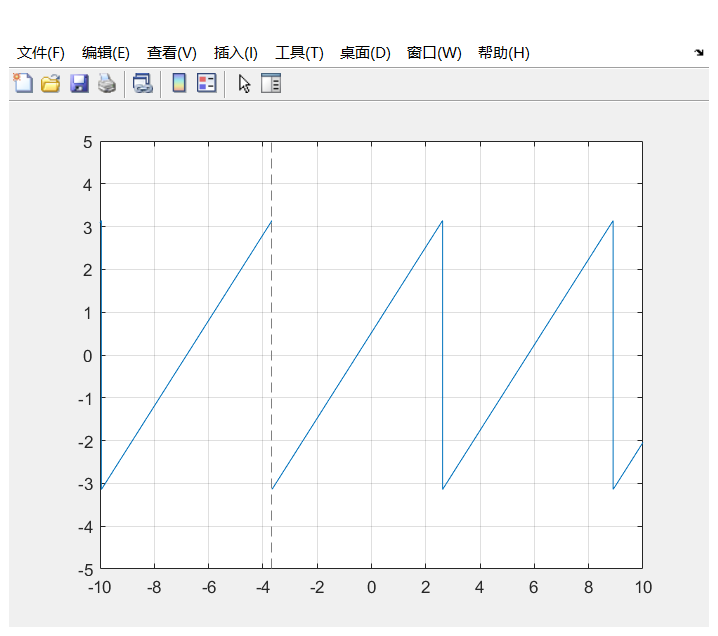
****

**辐角：**

源码：

|  |
| --- |
| t = sym('t');  ft = angle(2\*exp(1i\*(t+pi/6)));  fplot(ft,[-10,10]);  axis([-10,10,-5,5]);  grid on; |

运行结果

****