

Inbuilt Functions Tutorial

Fourier Transforms

Q1.

$$f(t) = \begin{cases} 1 - |t| & -1 \leq t < 1 \\ 0 & \text{otherwise} \end{cases}$$

```
syms t;  
f = (1-abs(t)).*(heaviside(t-(-1))-heaviside(t-1));  
fourier(f)
```

ans =

$$\frac{2}{w^2} + \frac{e^{wi}i}{w} - \frac{e^{-wi}}{w^2} - \frac{e^{wi}}{w^2} + \frac{\sin(w) + \cos(w)i}{w} - \frac{-\sin(w) + \cos(w)i}{w} - \frac{e^{-wi}i}{w}$$

Q2.

$$f(t) = \begin{cases} t \cdot e^t & t > 0 \\ 0 & \text{otherwise} \end{cases}$$

```
syms t;  
f = (t*exp(t)).*(heaviside(t-0))
```

f = $t e^t \text{heaviside}(t)$

```
fourier(f)
```

ans =

$$\frac{1}{(-1 + wi)^2} + \text{fourier}(t e^t, t, w)$$

Laplace Transforms

Q1.

$$f(t) = \begin{cases} 1 & 0 \leq t < \pi \\ \sin(t) & t \geq \pi \end{cases}$$

```
syms t;  
f = 1*(heaviside(t-0)-heaviside(t-pi)) + sin(t)*(heaviside(t-pi))
```

f = $\text{heaviside}(t) - \text{heaviside}(t - \pi) + \sin(t) \text{heaviside}(t - \pi)$

```
laplace(simplify(f))
```

ans =

$$\frac{1}{s} - \frac{e^{-\pi s}}{s} - \frac{e^{-\pi s}}{s^2 + 1}$$

Vector Plots

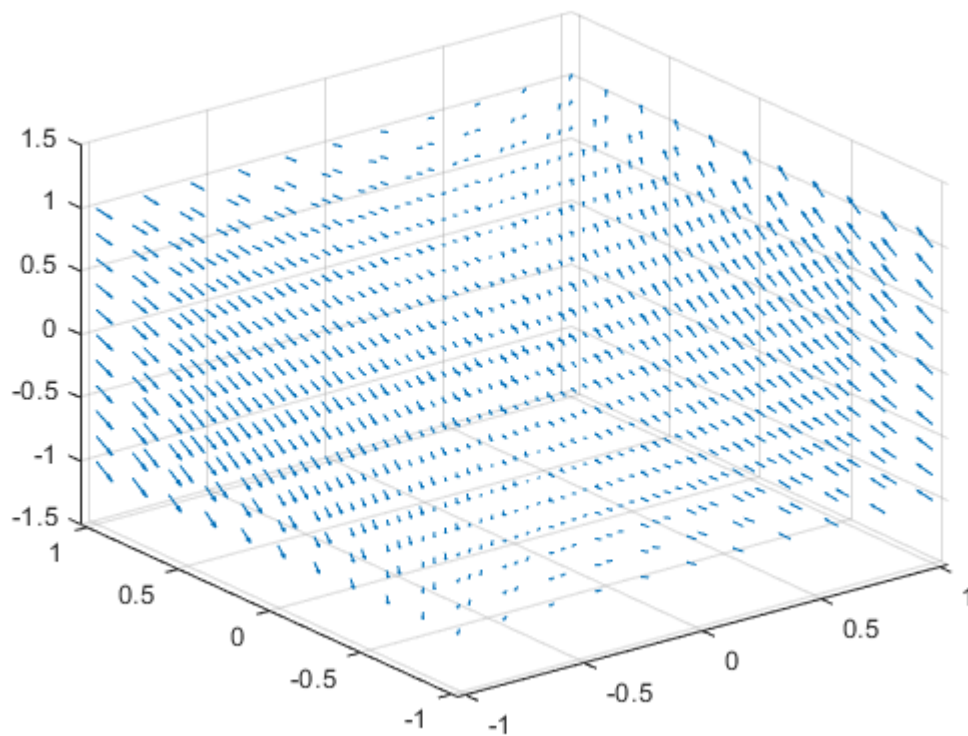
Q1.

$$F = yi + xj + (x - 2y + z)k$$

in the interval $-1 \leq x \leq 1, -1 \leq y \leq 1, -1 \leq z \leq 1$

```
[x, y, z] = meshgrid(-1:0.2:1, -1:0.2:1, -1:0.2:1);
u = y;
v = x;
w = x-2.*y+z;

quiver3(x, y, z, u, v, w)
```



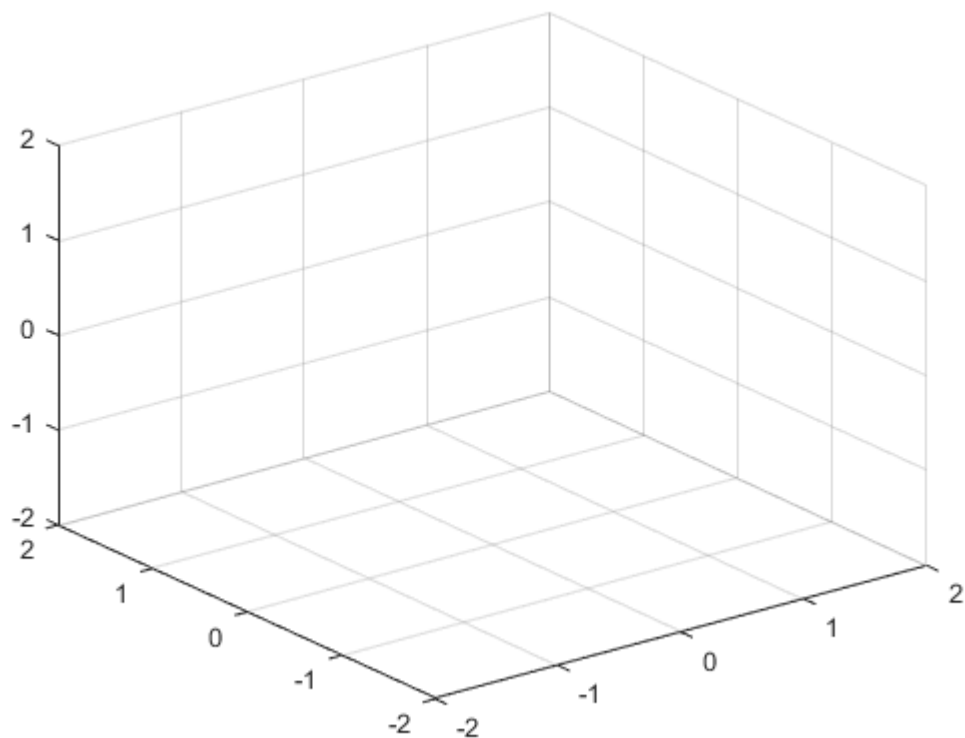
$$F = \frac{x}{z}i - \frac{y}{z}j + \frac{z}{4}k$$

$-2 \leq x \leq 2; -2 \leq y \leq 2; -2 \leq z \leq 2$

```
[x, y, z] = meshgrid(-2:0.2:2, -2:0.2:2, -2:0.2:2);
u = x./z;
v = (-y)./z;
```

```
w = z./x;
```

```
quiver3(x, y, z, u, v, w)
```



```
[x, y, z] = meshgrid(-2:0.2:2, -2:0.2:2, -2:0.2:2);
```

```
u = (x.^2).*y.*z;
```

```
v = x.*(y.^2).*z;
```

```
w = x.*y.*(z.^2);
```

```
quiver3(x, y, z, u, v, w)
```

