The purpose of this notebook is to show (i.e. decode) the meaning visually of the various Mathematica FourierTransform FourierParameters options available. Shows all the conventions (modern physics, pure math, signal processing, classical physics).

```
Options[FourierTransform]
```

```
{Assumptions :→ $Assumptions, GenerateConditions → False, FourierParameters → {0, 1}}
```

```
ClearAll[fourier, inverseFourier, f(*, ω*)]
inverseFourier[a_, b_] := TraditionalForm[
  Sqrt[Abs[b] / ((2 Pi) ^ (1 + a))]
   Integrate[f[ω] Exp[-i b ω t], {ω, -Infinity, Infinity}]]
fourier[a_, b_] := TraditionalForm[
  Sqrt[Abs[b] / ((2 Pi) ^ (1 - a))]
   Integrate[f[t] Exp[i b ω t], {t, -Infinity, Infinity}]]
```

Default modern physics convention:

```
fourier[0, 1]
inverseFourier[0, 1]

FourierTransform[Sinc[t], t, ω]
FourierTransform[Sinc[t], t, ω, FourierParameters → {0, 1}]

FourierTransform[Sinc[t], t, w]
FourierTransform[Sinc[t], t, w, FourierParameters → {0, 1}]
(*FourierTransform[Sinc[t],t,w,FourierParameters→{0,-2 Pi}]*)
```

$$\frac{\int_{-\infty}^{\infty} f(t)\, e^{i t \omega}\, dt}{\sqrt{2\pi}}$$

$$\frac{\int_{-\infty}^{\infty} f(\omega)\, e^{-i t \omega}\, d\omega}{\sqrt{2\pi}}$$

$$\frac{1}{2}\sqrt{\frac{\pi}{2}}\,(\text{Sign}[1-\omega]+\text{Sign}[1+\omega])$$

$$\frac{1}{2}\sqrt{\frac{\pi}{2}}\,(\text{Sign}[1-\omega]+\text{Sign}[1+\omega])$$

$$\frac{1}{2}\sqrt{\frac{\pi}{2}}\,(\text{Sign}[1-\text{w}]+\text{Sign}[1+\text{w}])$$

$$\frac{1}{2}\sqrt{\frac{\pi}{2}}\,(\text{Sign}[1-\text{w}]+\text{Sign}[1+\text{w}])$$

Convention for pure mathematics, systems engineering:

```
fourier[-1, 1]
inverseFourier[-1, 1]

FourierTransform[Sinc[t], t, ω, FourierParameters → {-1, 1}]
```

$$\frac{\int_{-\infty}^{\infty} f(t)\, e^{i t \omega}\, dt}{2\pi}$$

$$\int_{-\infty}^{\infty} F(\omega)\, e^{-i t \omega}\, d\omega$$

$$\frac{1}{4}\,\text{Sign}[1-\omega]+\frac{1}{4}\,\text{Sign}[1+\omega]$$

Convention for classical physics:

```
fourier[1, -1]
inverseFourier[1, -1]

FourierTransform[Sinc[t], t, ω, FourierParameters → {1, -1}]
```

$$\int_{-\infty}^{\infty} f(t)\, e^{-i t \omega}\, dt$$

$$\frac{\int_{-\infty}^{\infty} F(\omega)\, e^{i t \omega}\, d\omega}{2\pi}$$

$$\frac{1}{2}\pi\, \mathrm{Sign}[1-\omega] + \frac{1}{2}\pi\, \mathrm{Sign}[1+\omega]$$

Convention for signal processing:

```
fourier[0, -2 Pi]
inverseFourier[0, -2 Pi]

FourierTransform[Sinc[t], t, ω]
FourierTransform[Sinc[t], t, ω, FourierParameters → {0, -2 Pi}]
FourierTransform[Sinc[t], t, ω, FourierParameters → {0, 2 Pi}]
```

$$\int_{-\infty}^{\infty} f(t)\, e^{-2\pi i t \omega}\, dt$$

$$\int_{-\infty}^{\infty} F(\omega)\, e^{2\pi i t \omega}\, d\omega$$

$$\frac{1}{2}\pi\, \mathrm{Sign}[1-2\pi\omega] + \frac{1}{2}\pi\, \mathrm{Sign}[1+2\pi\omega]$$

$$\frac{1}{2}\pi\, \mathrm{Sign}[1-2\pi\omega] + \frac{1}{2}\pi\, \mathrm{Sign}[1+2\pi\omega]$$

$$\frac{1}{2}\pi\, \mathrm{Sign}[1-2\pi\omega] + \frac{1}{2}\pi\, \mathrm{Sign}[1+2\pi\omega]$$