

```
> restart;
> u:=t->piecewise(t<0,0,1):f:=unapply(exp(-t/5)*u(t),t);cv:=1/sqrt(2*Pi):
```

$$f:=t \rightarrow e^{-\frac{1}{5}t} \text{ piecewise}(t < 0, 0, 1) \quad (1)$$

```
> FT[f]:=inttrans[fourier](cv*f(t),t,w);
```

$$FT_f := \frac{5}{2} \frac{\sqrt{2}}{\sqrt{\pi} (1 + 5 I w)} \quad (2)$$

```
> assume(w,real):R:=unapply(Re(FT[f]),w);C:=unapply(Im(FT[f]),w);
```

$$R := w \rightarrow \frac{5}{2} \frac{\sqrt{2}}{\sqrt{\pi} (1 + 25 w^2)}$$

$$C := w \rightarrow -\frac{25}{2} \frac{\sqrt{2} w}{\sqrt{\pi} (1 + 25 w^2)} \quad (3)$$

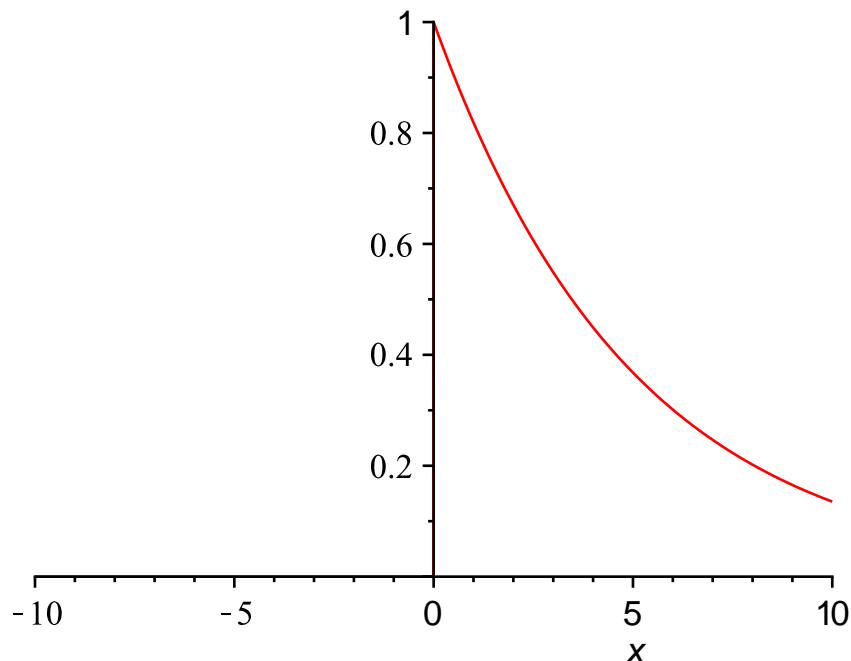
```
> Mag:=unapply(simplify(sqrt(R(w)^2+C(w)^2)),w);
```

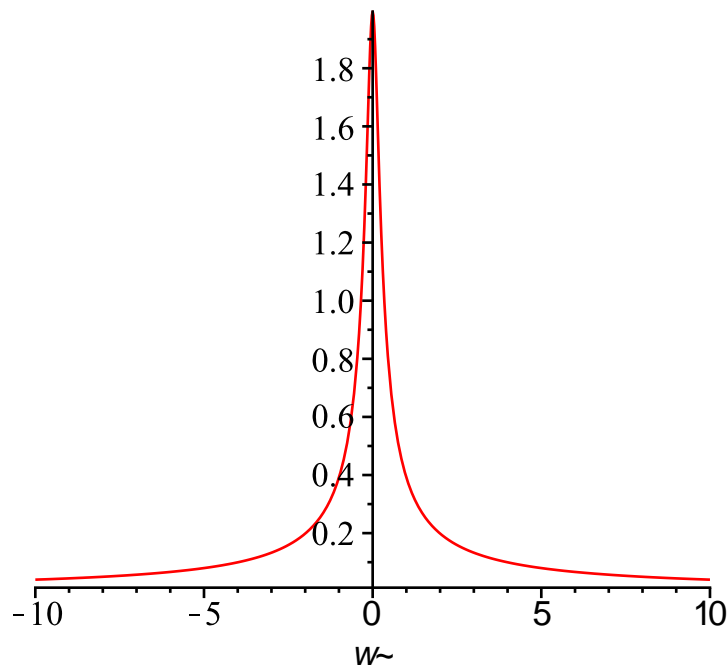
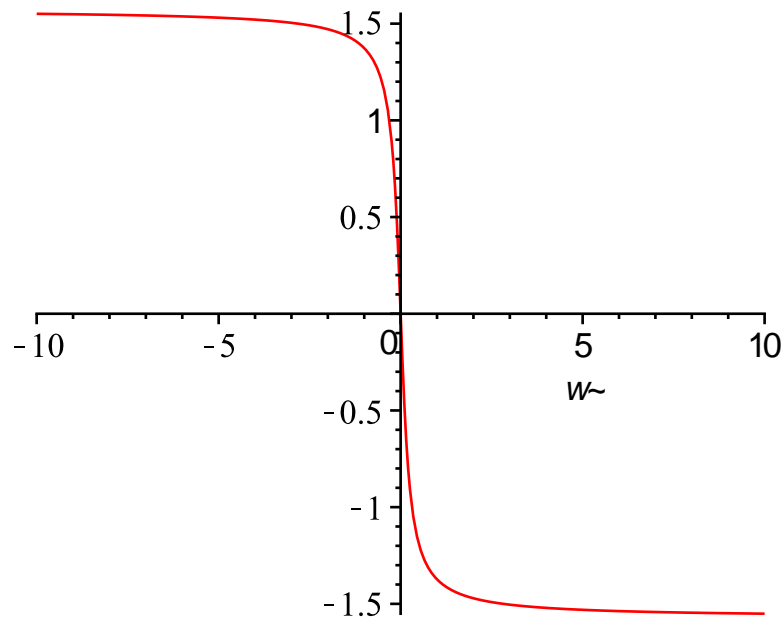
$$Mag := w \rightarrow \frac{5}{2} \frac{\sqrt{2}}{\sqrt{1 + 25 w^2} \sqrt{\pi}} \quad (4)$$

```
> Phase:=unapply(arctan(C(w)/R(w)),w);
```

$$Phase := w \rightarrow -\arctan(5 w) \quad (5)$$

```
> plot(f(x),x=-10..10);plot(Phase(w),w=-10..10);plot(Mag(w),w=-10..10);
```





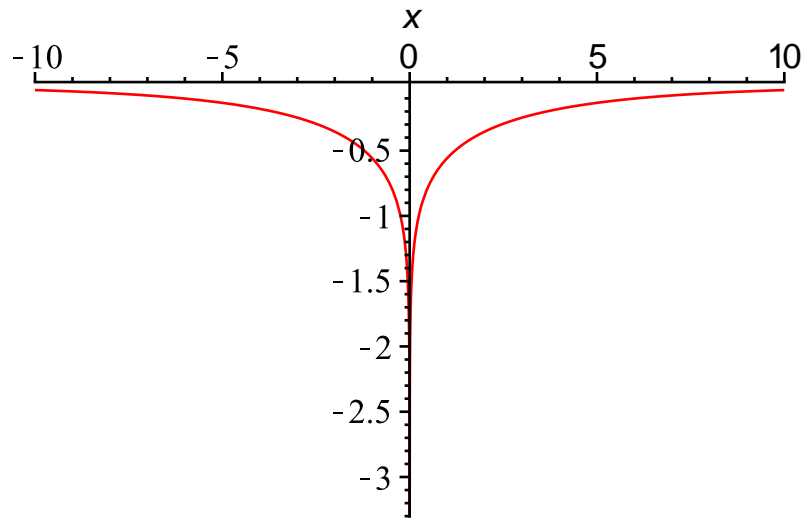
```
> inttrans[invfourier](Mag(w)/cv,w,x);
```

$$\frac{1}{4} \text{BesselY}\left(0, -\frac{1}{5} Ix\right) + \frac{1}{4} \text{BesselY}\left(0, \frac{1}{5} Ix\right) \quad (6)$$

```
> MagInv:=unapply(%,x);
```

$$\text{MagInv} := x \rightarrow \frac{1}{4} \text{BesselY}\left(0, -\frac{1}{5} Ix\right) + \frac{1}{4} \text{BesselY}\left(0, \frac{1}{5} Ix\right) \quad (7)$$

```
> plot(MagInv(x),x=-10..10); # Not a replica of f(x)!
```



```

> # Answer check.
inttrans[invfourier](Mag(w)*exp(I*Phase(w))/cv,w,x);
e-1/5 x Heaviside(x)

```

(8)