

```

> # Example. f(x) = exp(-x)*u(x)
> # Display the signal graph, the magnitude graph,
> # and the phase graph.

> # Fourier transforms need the integral of |f(x)| to be finite.
> # Justify this detail below.

> u:=x->piecewise(x<0,0,1);f:=unapply(exp(-x)*u(x),x);cv:=1/sqrt(2*
  Pi):
> int(abs(f(x)),x=-infinity..infinity); # Need a finite integral.
      u := x → piecewise(x < 0, 0, 1)
      f := x → e-x piecewise(x < 0, 0, 1)
      1
(1)
> F:=unapply(inttrans[fourier](cv*f(x),x,w),w);
      F := w →  $\frac{1}{2} \frac{\sqrt{2}}{\sqrt{\pi} (1 + Iw)}$ 
(2)
> Mag:=unapply(abs(F(w)),w);
      Mag := w →  $\frac{1}{2} \frac{\sqrt{2}}{\sqrt{\pi} |1 + Iw|}$ 
(3)
> Phase:=unapply(arctan(Im(F(w))/Re(F(w))),w);
      Phase := w →  $-\arctan\left(\frac{\Re(w)}{1 - \Im(w)}\right)$ 
(4)
> optx:=-3..3,scaling=unconstrained,thickness=3:
> optw:=-10..10,-2..2,scaling=unconstrained,thickness=2,color=blue:
> plot(f,optx);plot(Mag,optw);plot(Phase,optw);

```



