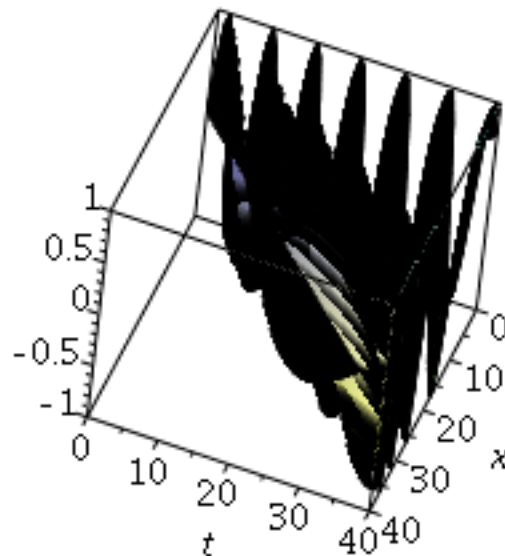


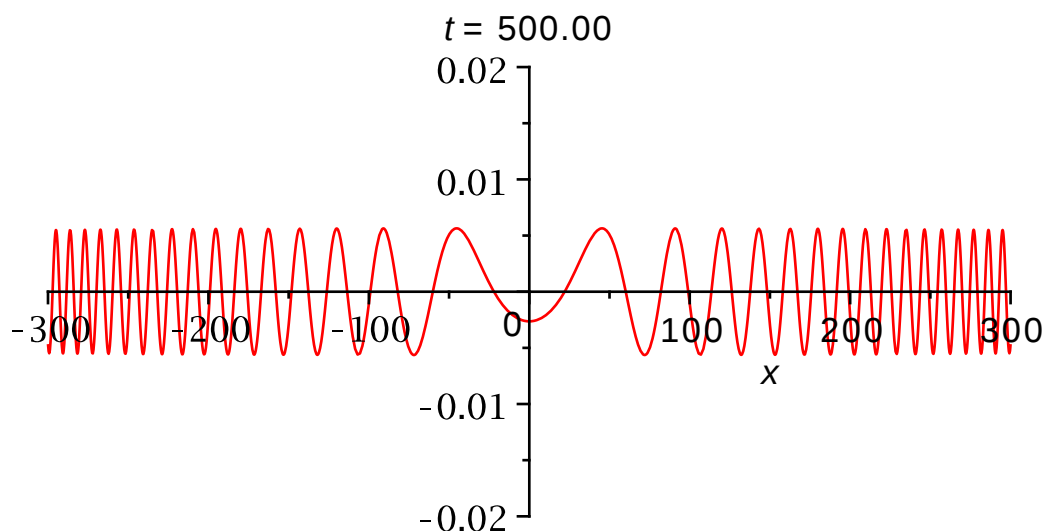
```
> plot3d( sin( sqrt(t^2 - x^2) ), x=0..40, t=0..40,
          axes=boxed, numpoints=5000);
```



```
> u:= 1/sqrt(t)*1/sqrt(4*Pi*alpha)*exp(-k[0]^2/(4*alpha))*sin
      (sqrt(t^2-x^2));
u:= simplify(subs( k[0]= (x/t)/sqrt(1-(x/t)^2),subs(omega= k[0]
^2+1, u))):
u:= evalf(subs({alpha=5}, u)):
```

$$u := \frac{1}{2} \frac{e^{-\frac{1}{4} \frac{k_0^2}{\alpha}} \sin(\sqrt{t^2 - x^2})}{\sqrt{t} \sqrt{\pi \alpha}}$$

```
> with(plots):
animate( plot, [ u, x=-300..300,-0.02..0.02], t=10..500,
frames=100);
```



```
> diff(u,x);
```

$$\frac{1}{\sqrt{t}} \left(0.1261566261 \left(-\frac{0.10000000000 x}{(t-1.x)(t+x)} - \frac{0.05000000000 x^2}{(t-1.x)^2(t+x)} + \frac{0.05000000000 x^2}{(t-1.x)(t+x)^2} \right) e^{-\frac{0.05000000000 x^2}{(t-1.x)(t+x)}} \sin(\sqrt{t^2-1.x^2}) \right) - \frac{0.1261566261 e^{-\frac{0.05000000000 x^2}{(t-1.x)(t+x)}} \cos(\sqrt{t^2-1.x^2}) x}{\sqrt{t} \sqrt{t^2-1.x^2}}$$

> $u2 := \sin(k \cdot x + \text{omega} \cdot t);$
 $u2 := \text{subs}(\text{omega} = (\gamma^2 \cdot k^2 + c)^{\frac{1}{2}}, u2);$
 $u\text{plot} := \text{subs}(\{c = 1, \text{gamma} = 1, k = 1\}, u2);$
 $u\text{plot2} := \frac{1}{10} \cdot \text{sum}(\text{subs}(\{c = 1, \text{gamma} = 1, k = 1 + 0.1 \cdot l\}, u2), l = 1 .. 10);$

$$u2 := \sin(kx + \omega t)$$

$$u2 := \sin(kx + \sqrt{\gamma^2 k^2 + c} t)$$

$$u\text{plot} := \sin(x + \sqrt{2} t)$$

$$u\text{plot2} := \frac{1}{10} \sin(1.100000000 x + 1.486606875 t) + \frac{1}{10} \sin(1.200000000 x \quad (1)$$

$$+ 1.562049935 t) + \frac{1}{10} \sin(1.300000000 x + 1.640121947 t)$$

$$+ \frac{1}{10} \sin(1.400000000 x + 1.720465054 t) + \frac{1}{10} \sin(1.500000000 x$$

$$+ 1.802775638 t) + \frac{1}{10} \sin(1.600000000 x + 1.886796226 t)$$

$$+ \frac{1}{10} \sin(1.700000000 x + 1.972308292 t) + \frac{1}{10} \sin(1.800000000 x$$

$$+ 2.059126028 t) + \frac{1}{10} \sin(1.900000000 x + 2.147091055 t) + \frac{1}{10} \sin(2. x$$

$$+ 2.236067977 t)$$

> $u2 := \sin(k \cdot x + \text{omega} \cdot t);$
 $u2 := \text{subs}(\text{omega} = k, u2);$
 $u\text{plot} := \text{subs}(\{c = 1, \text{gamma} = 1, k = 1\}, u2);$
 $u\text{plot2} := \frac{1}{10} \cdot \text{sum}(\text{subs}(\{c = 1, \text{gamma} = 1, k = 1 + 0.1 \cdot l\}, u2), l = 1 .. 10);$

$$u2 := \sin(kx + \omega t)$$

$$u2 := \sin(kx + kt)$$

$$uplot := \sin(t + x)$$

$$\begin{aligned} uplot2 := & \frac{1}{10} \sin(1.100000000 x + 1.100000000 t) + \frac{1}{10} \sin(1.200000000 x \\ & + 1.200000000 t) + \frac{1}{10} \sin(1.300000000 x + 1.300000000 t) \\ & + \frac{1}{10} \sin(1.400000000 x + 1.400000000 t) + \frac{1}{10} \sin(1.500000000 x \\ & + 1.500000000 t) + \frac{1}{10} \sin(1.600000000 x + 1.600000000 t) \\ & + \frac{1}{10} \sin(1.700000000 x + 1.700000000 t) + \frac{1}{10} \sin(1.800000000 x \\ & + 1.800000000 t) + \frac{1}{10} \sin(1.900000000 x + 1.900000000 t) + \frac{1}{10} \sin(2. x \\ & + 2. t) \end{aligned} \quad (2)$$

> *with(plots) :*
animate(plot, [uplot2, x = 0..100, -1.1..1.1], t = 1..100, frames = 100);

