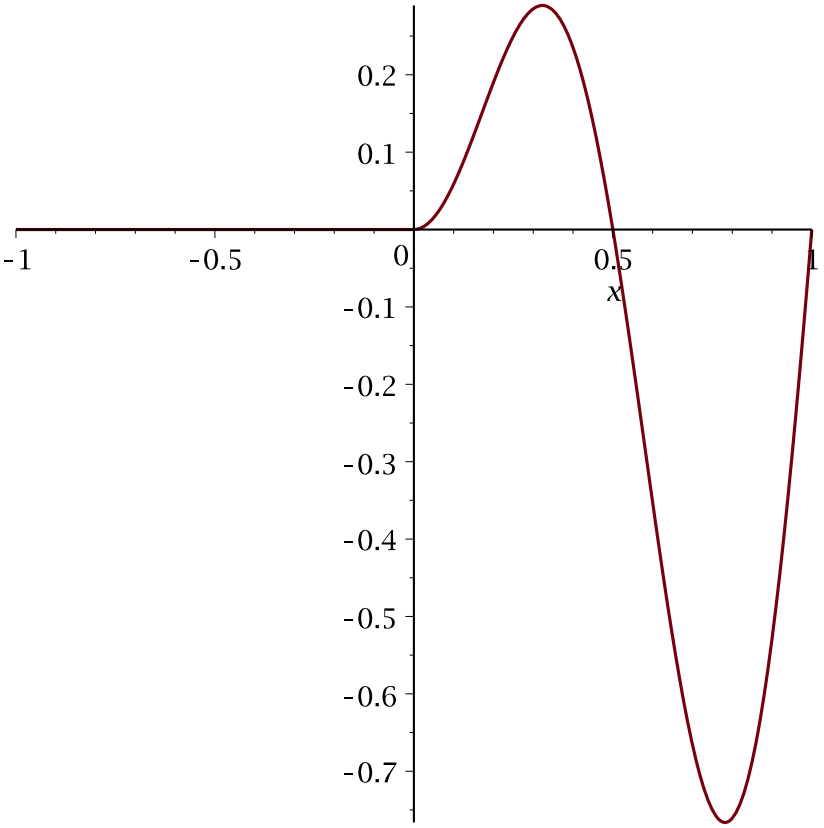
```
> # Demonstrates solutions constructed via method of exercise 4.4.7.
> with(plots): with(plottools):
> #Define initial position function on [0,L]
  L:=1;
  # Something asymmetric.
  f:=x->piecewise(x>=0 and x<=L, sin(2*Pi*x/L)*x);
```

$$L := 1$$

$$f := x \to piecewise\left(0 \le x \text{ and } x \le L, \sin\left(\frac{2\,\pi\,x}{L}\right) x\right) \quad (1)$$

```
> plot(f(x),x=-L..L);
```

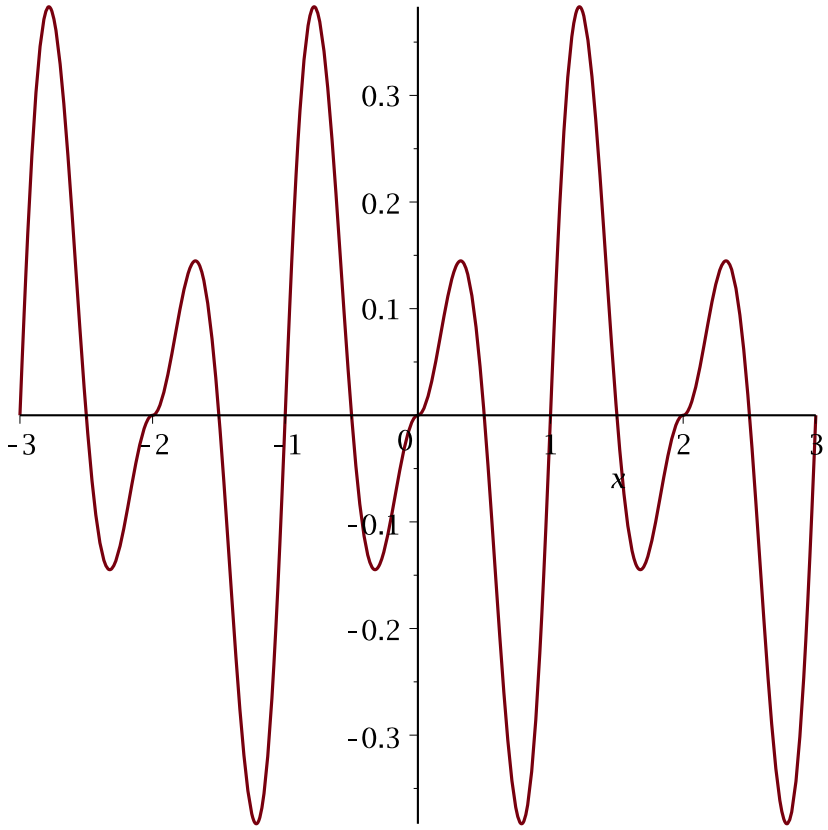



```
> #Define odd periodic extension of f
  fodd:=x->(f(x)-f(-x))/2;
  F:=x->fodd(x-floor((x+L)/2/L)*2*L);
```

$$fodd := x \to \frac{1}{2} f(x) - \frac{1}{2} f(-x)$$

$$F := x \to fodd\left(x - 2\,\text{floor}\left(\frac{1}{2}\,\frac{x+L}{L}\right) L\right) \quad (2)$$

```
> plot(F(x),x=-3*L..3*L);
```

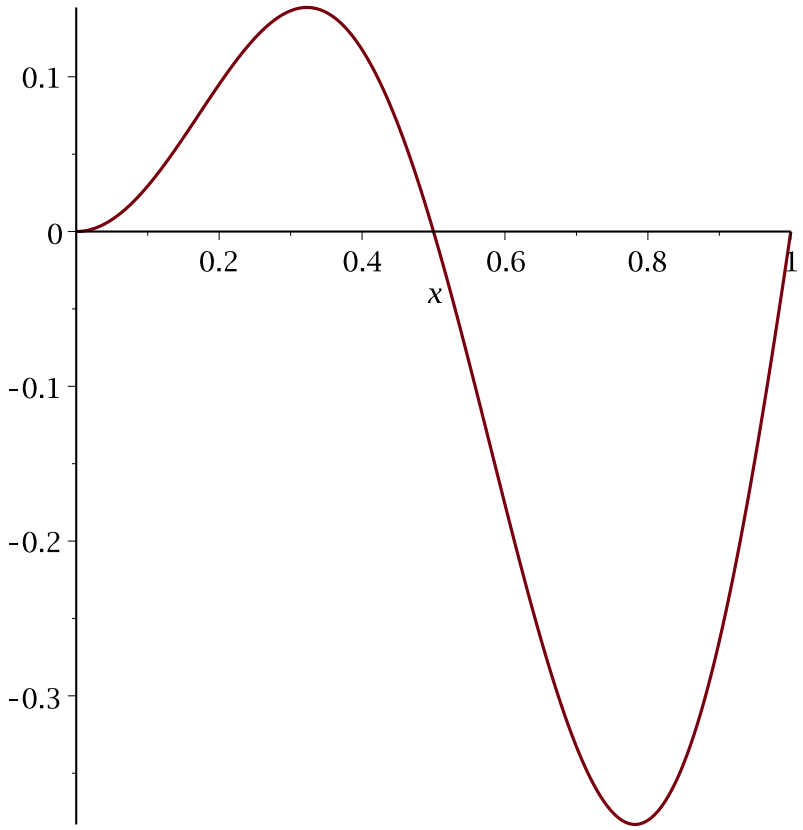



```
> #Solution of wave eqn as sum of left/right waves.
  c:=1;
  u:=(x,t)->(F(x-c*t)+F(x+c*t))/2;
```

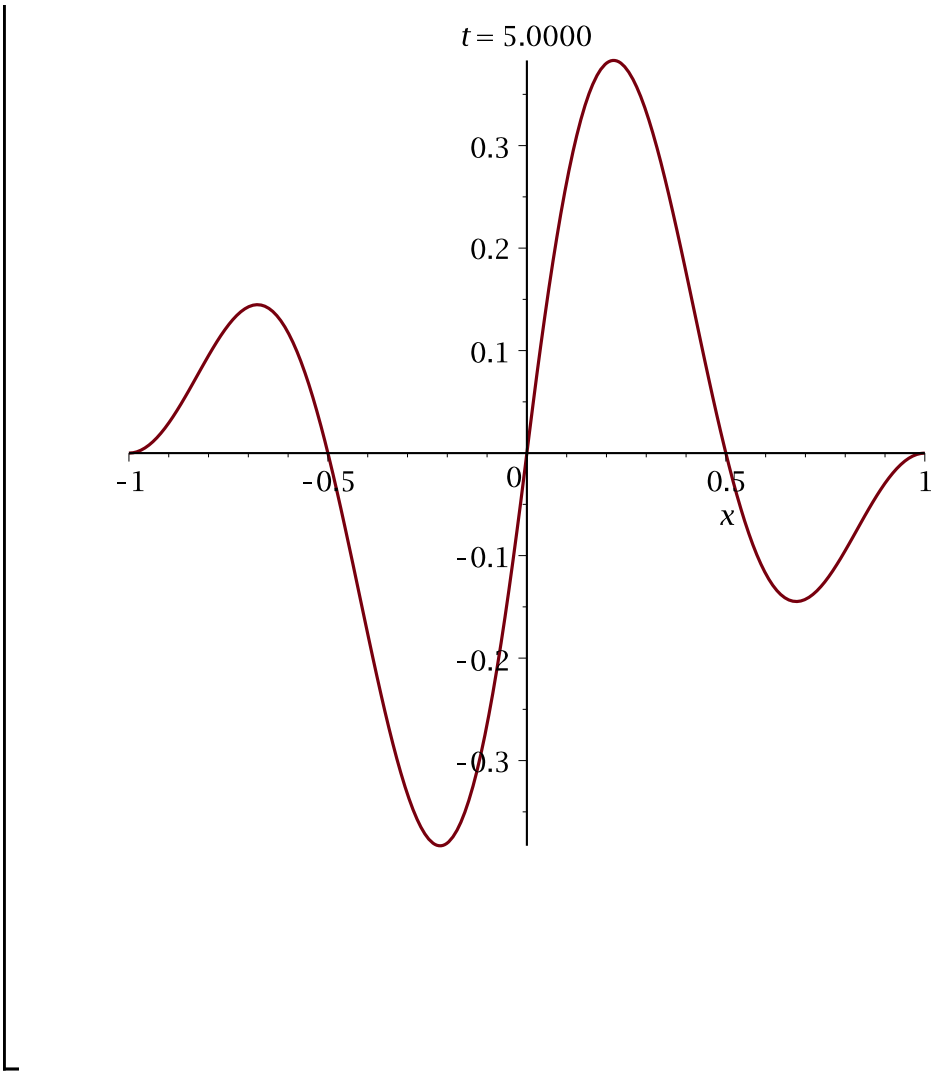
$$c := 1$$

$$u := (x, t) \rightarrow \frac{1}{2} F(x - c\,t) + \frac{1}{2} F(x + c\,t) \qquad (3)$$

```
> plot(u(x,0),x=0..L);
```




```
> animate(plot,[u(x,t),x=-L..L],t=0..5,frames=100);
```


t = 5.0000
0.3
0.2
0.1
-1
-0.5
0
0.5
1
x
-0.1
-0.2
-0.3