```
> restart: with(plots):
> mode := (x,t) -> xi^(t) * exp(I*k*x);
```

$$mode := (x, t) \mapsto \xi^{t}\, e^{I k x} \tag{1}$$

```
> up := mode(0,1); hr := mode(0,0); dn := mode(0,-1);
```

$$up := \xi$$

$$hr := 1$$

$$dn := \frac{1}{\xi} \tag{2}$$

```
> lt := mode(-1,0); rt := mode(1,0);
```

$$lt := e^{-I k}$$

$$rt := e^{I k} \tag{3}$$

```
> (lt + rt - 2*hr)/dx^2 = (up - hr)/(dt); dt := alpha*dx^2;
```

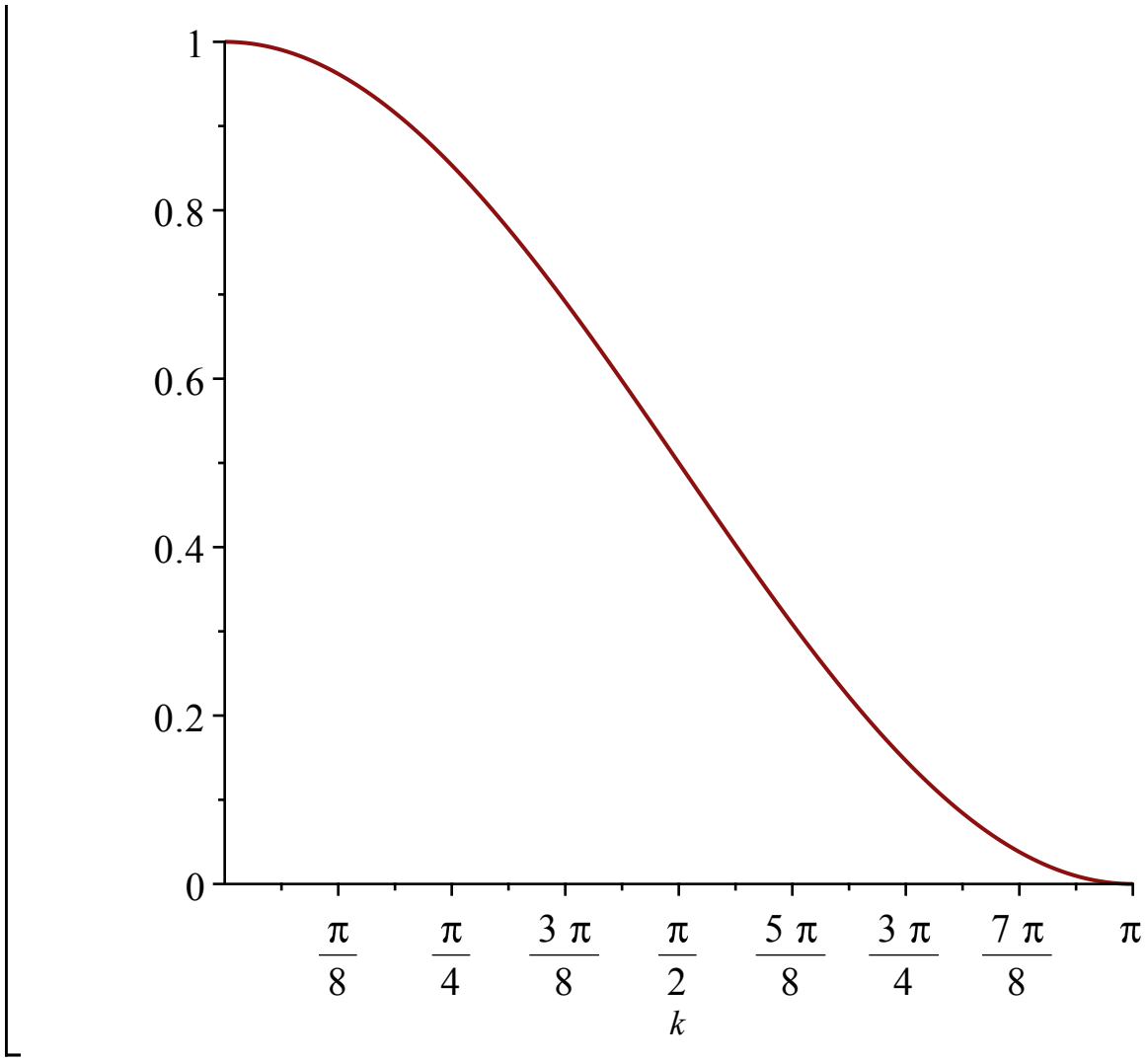
$$\frac{e^{-I k} + e^{I k} - 2}{dx^{2}} = \frac{\xi - 1}{dt}$$

$$dt := \alpha\, dx^{2} \tag{4}$$

```
> X:=solve(%%,xi):
> xi[1] := simplify(X);
```

$$\xi_{1} := -2\,\alpha + 1 + 2\,\alpha \cos(k) \tag{5}$$

```
> eval(xi[1],alpha=0.25): plot([abs(%)], k = 0..Pi);
```


1
0.8
0.6
0.4
0.2
0
π/8
π/4
3 π/8
π/2
5 π/8
3 π/4
7 π/8
π
k