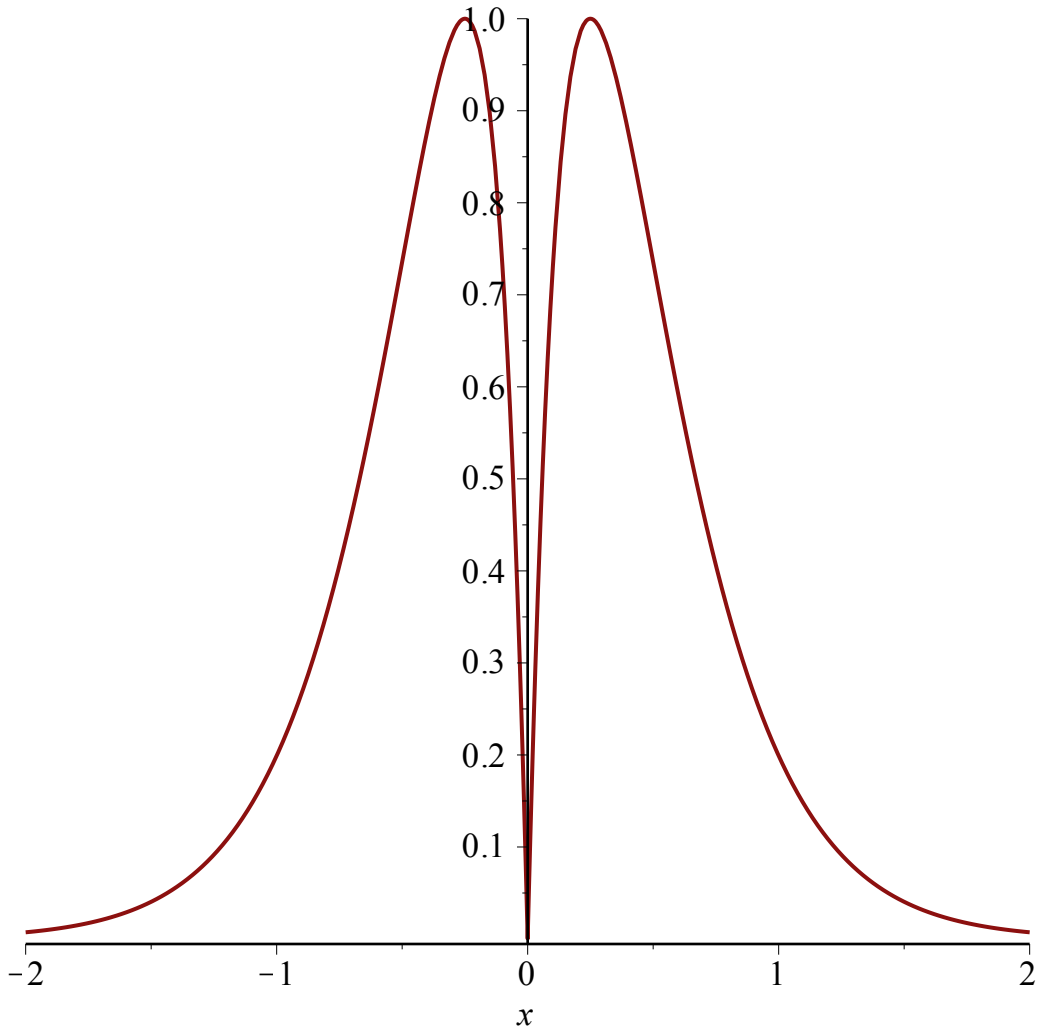
```
> restart:
> # measure of dissonance as fraction of whole tone separation
  r:=x->4*abs(x)*exp(1-4*abs(x));
```

$$r := x \rightarrow 4\,|x|\,e^{1-4\,|x|} \tag{1}$$

```
> plot(r(x),x=-2..2);
```




```
> # number of whole tones separating two frequencies
  nwt:=(a,b)->evalf(6*log(max(a,b)/min(a,b))/log(2));
```

$$nwt := (a, b) \rightarrow evalf\left(\frac{6\,\log\left(\frac{\max(a, b)}{\min(a, b)}\right)}{\log(2)}\right) \tag{2}$$

```
> # see if it works
  nwt(440,440*2^(2/12));
```

$$1. \tag{3}$$

```
> # choose base frequency and number of partials to consider
  f0:=1;
  nump:=8;
```

$$f0 := 1$$

$$nump := 8 \tag{4}$$

```
> # sum the dissonances between all partials of two tones (up to nump
  partials)
  diss:=proc(f) local i,j,d:
    if f=f0 then return 0 fi:
    d:=0:
    for i from 1 to nump do
      for j from 1 to nump do
        d:=d+evalf(r(nwt(i*f0,j*f))):
      od:
    od:
    return evalf(d):
  end:
> # plot the function diss(f) from f=f0 to f=2*f0. vertical lines
  show the equal-tempered scale
  plot(diss(f),f=f0..2*f0,axis[1]=[gridlines=[seq(f0*2^(k/12),k=0.
  .12)]]);
```