3. valikoe teht. 2

Jatketaan siita, mihin muuttujanerotteluprosessilla paastiin:

```
> bn:=simplify((2/(n*Pi))*(u1*(1-cos(n*Pi/2))-u2*(cos(n*Pi)-cos(n*Pi/2))));
```

$$bn := -2\,\frac{-u1 + u1\cos\left(\frac{1}{2}\,n\,\pi\right) + u2\cos(n\,\pi) - u2\cos\left(\frac{1}{2}\,n\,\pi\right)}{n\,\pi}$$

```
>  un:=bn*sin(n*x)*exp(-n^2*t);
```

$$un := -2\,\frac{\left(-u1 + u1\cos\left(\frac{1}{2}\,n\,\pi\right) + u2\cos(n\,\pi) - u2\cos\left(\frac{1}{2}\,n\,\pi\right)\right)\sin(n\,x)\,\mathbf{e}^{(-n^2\,t)}}{n\,\pi}$$

```
>
> uu:=sum(bn*sin(n*x)*exp(-n^2*t),n=1..20):
> uf:=unapply(uu,x,t):
```

Tama oli pieni kateva temppu, jolla Maple-lauseke (uu) muutetaan funktioksi (x,t)->uu)

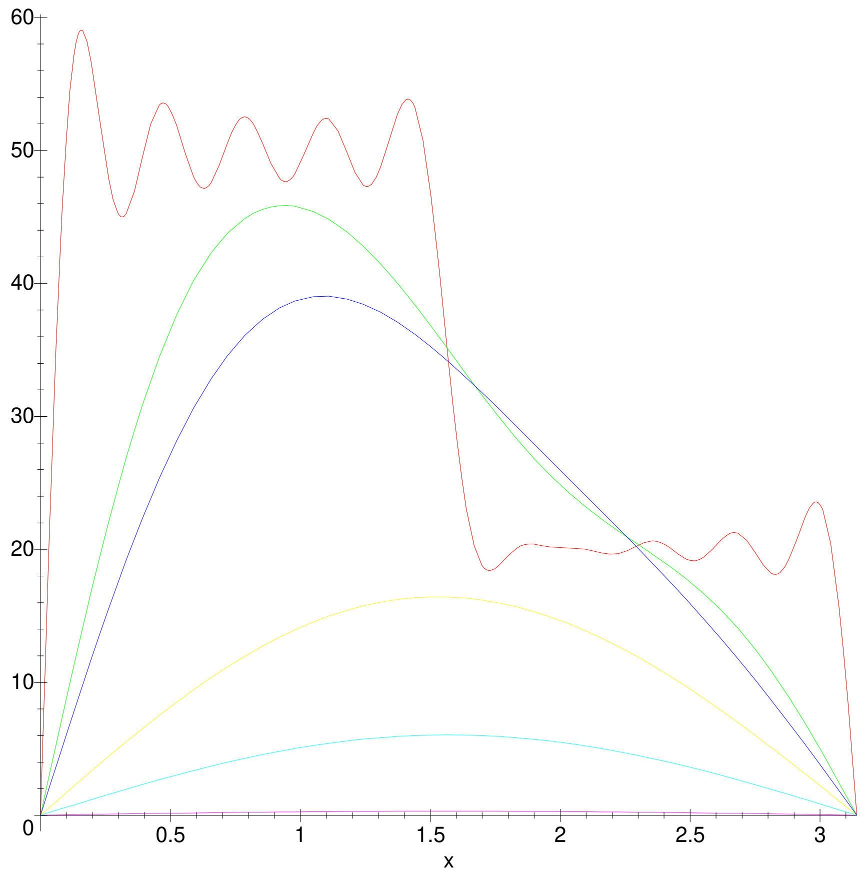
Piirtamista varten otetaan konreettiset numeroarvot, kuten:

```
> u1:=50;u2:=20;
```

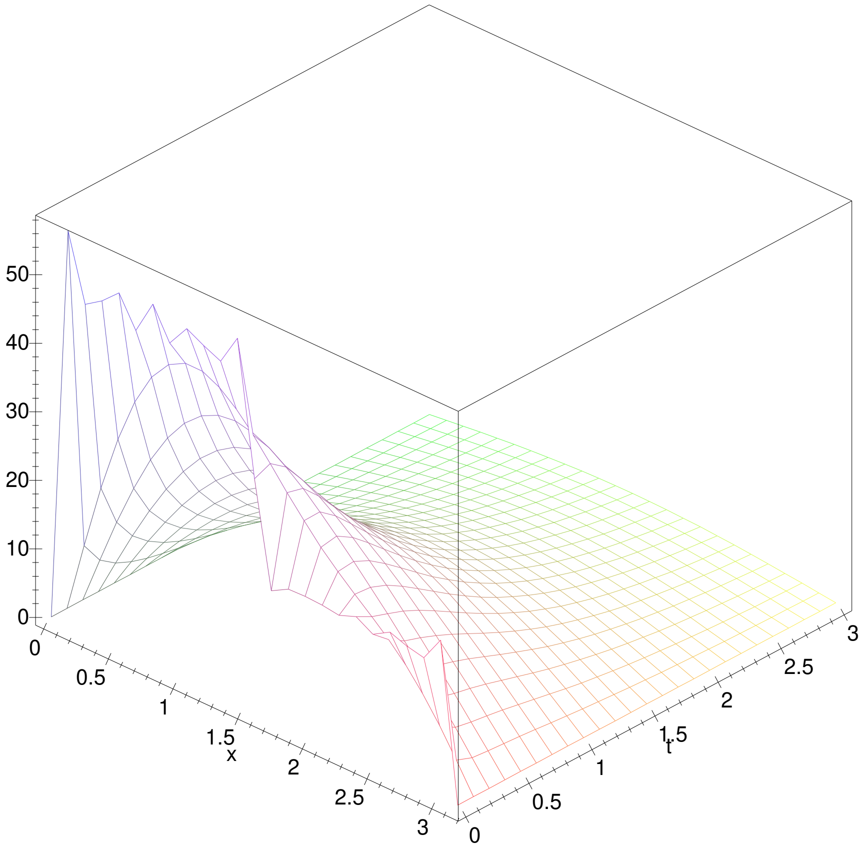
$$u1 := 50$$

$$u2 := 20$$

```
> plot({seq(uf(x,t),t=[0,0.1,0.2,1,2,5])},x=0..Pi);
```




```
> plot3d(uu,x=0..Pi,t=0..3,axes=boxed);
```


0
10
20
30
40
50
0
0.5
1
1.5
x
2
2.5
3
0
0.5
1
1.5
t
2
2.5
3