

Homework Assignment 9

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```
In [113]: using Autoreload
          require("nt_toolbox/nt_signal.jl")
          require("nt_toolbox/nt_general.jl")
          using nt_signal
          using nt_general
          using Gadfly
          using Images
```

Define first the function that generates the signal

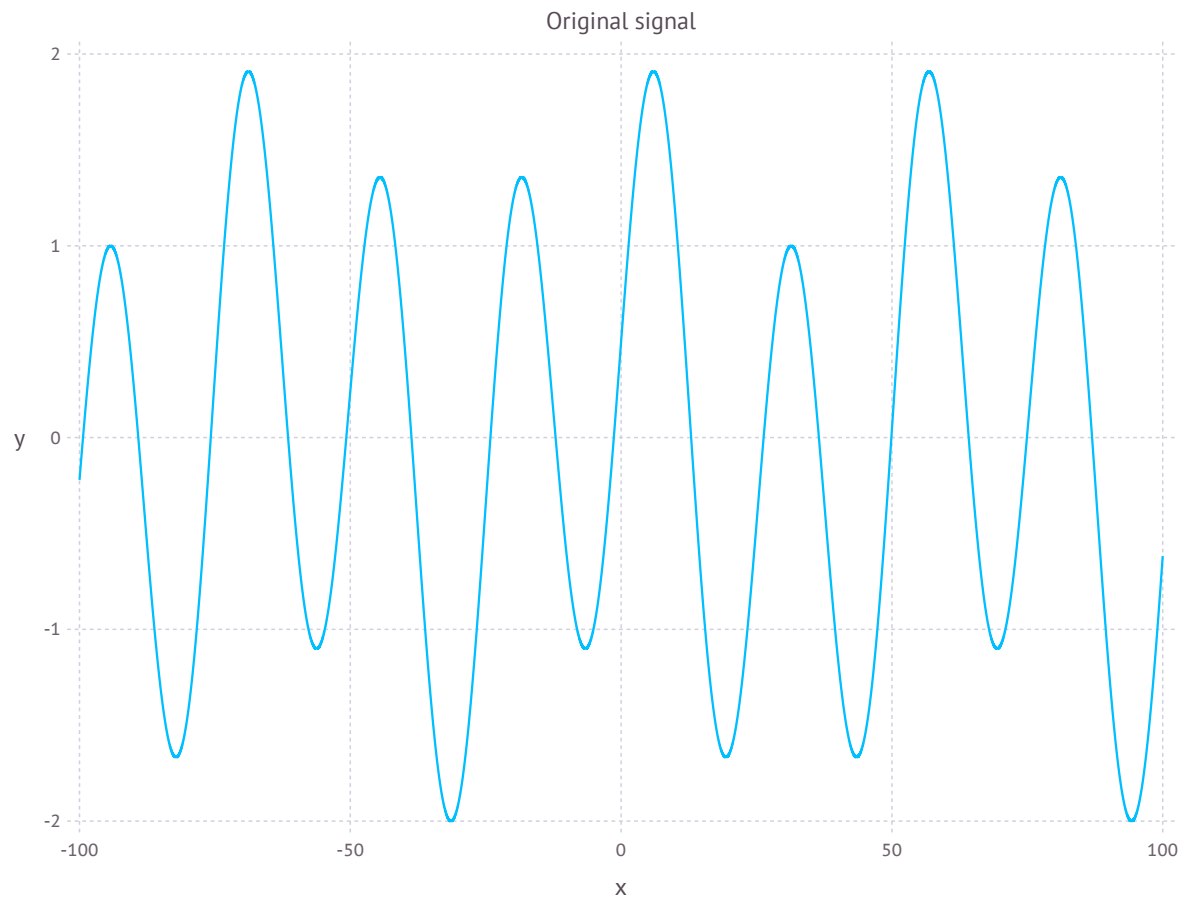
```
In [190]: f(x)=(cos(x/10)+3*sin(x/4))/2
          fs=f([-100:.005:100]);
```

```
In [191]: set_default_plot_size(20cm, 16cm)
```

Lets plot the funciton f and the sinc function

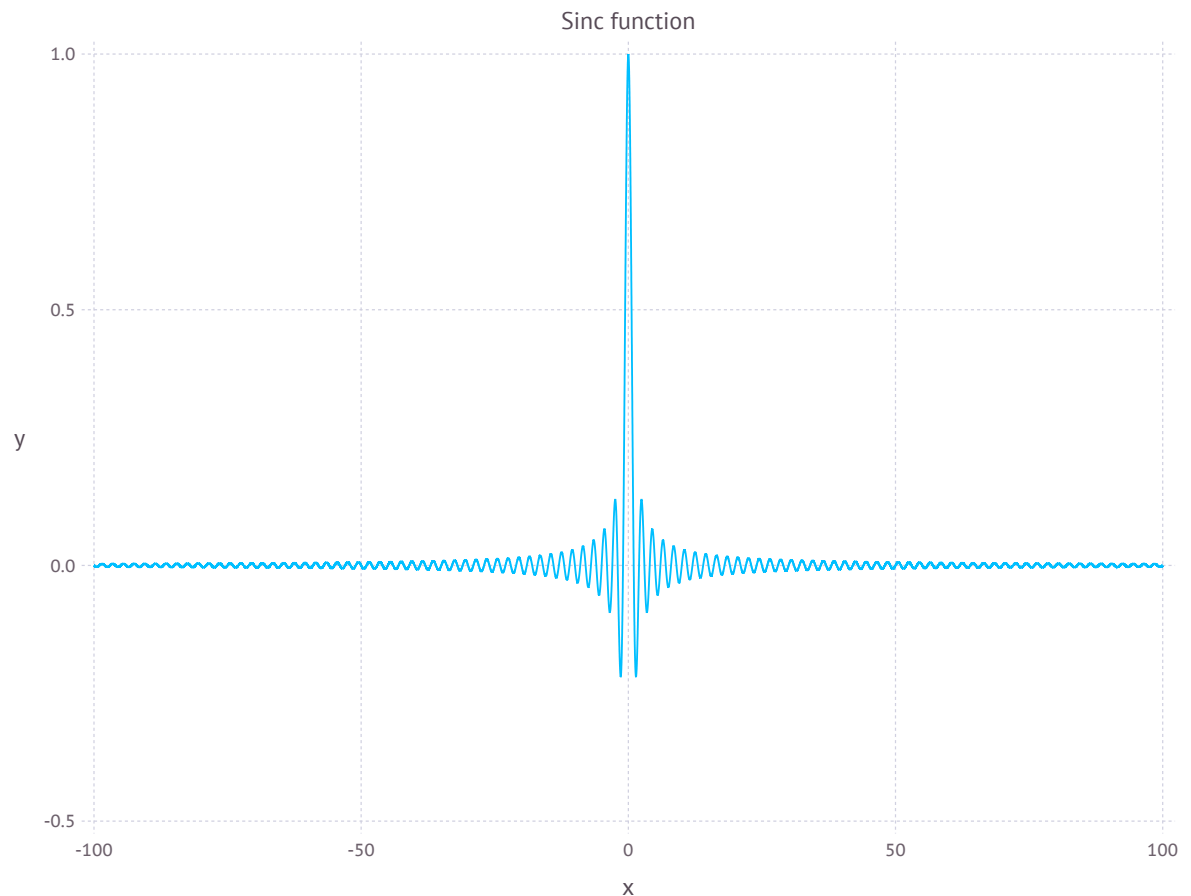
```
In [192]: plot(x=[-100:.005:100], y=fs,  
              Geom.line, Guide.title("Original signal"))
```

Out[192]:



```
In [193]: plot(x=[-100:.005:100], y=sinc([-100:.005:100]),  
             Geom.line, Guide.title("Sinc function"))
```

Out[193]:



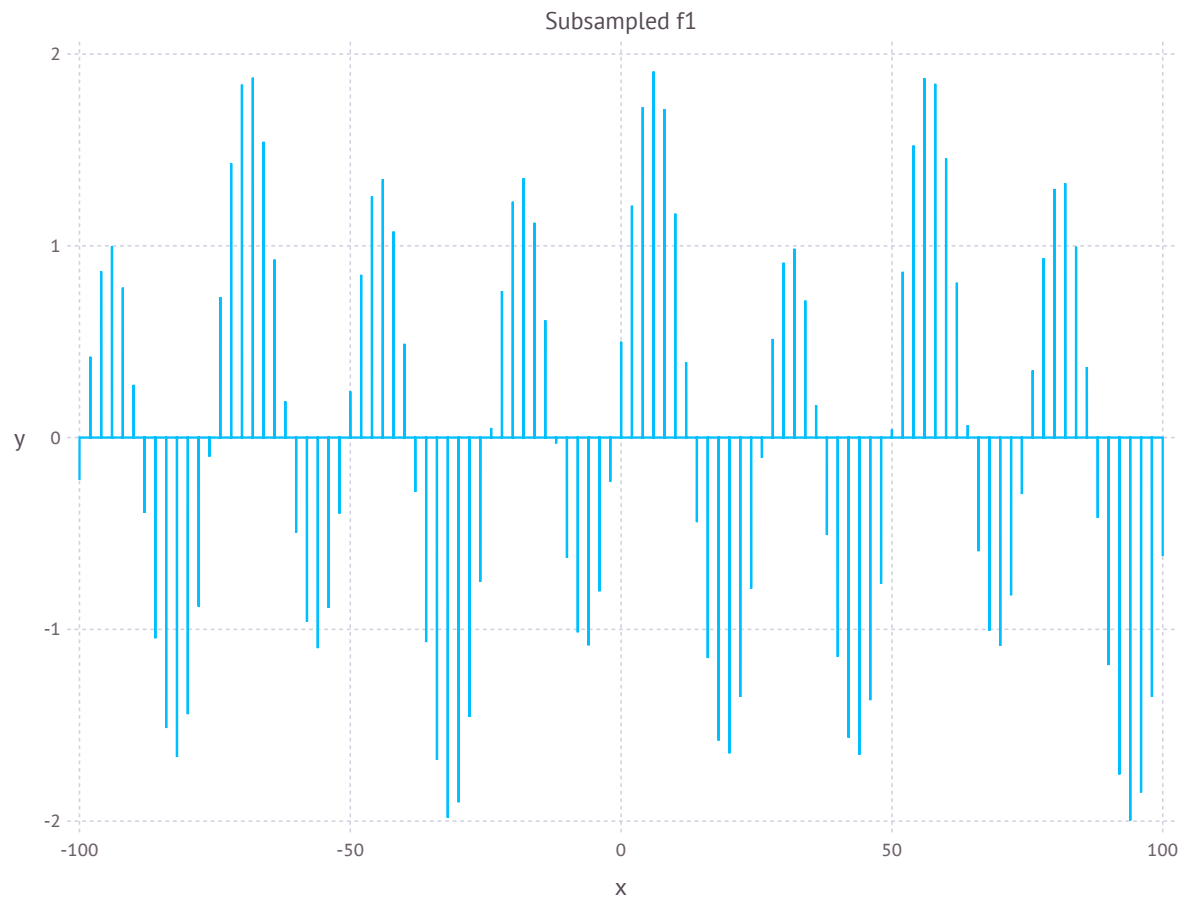
```
In [194]: 4%2
```

Out[194]: 0

```
In [195]: #Subsample of f  
f1=Float64[];  
for i in 1:length(fs)  
    if (i-1)%400==0  
        push!(f1,fs[i])  
    else  
        push!(f1,0)  
    end  
end  
f2=Float64[];  
for i in 1:length(fs)  
    if (i-1)%200==0  
        push!(f2,fs[i])  
    else  
        push!(f2,0)  
    end  
end
```

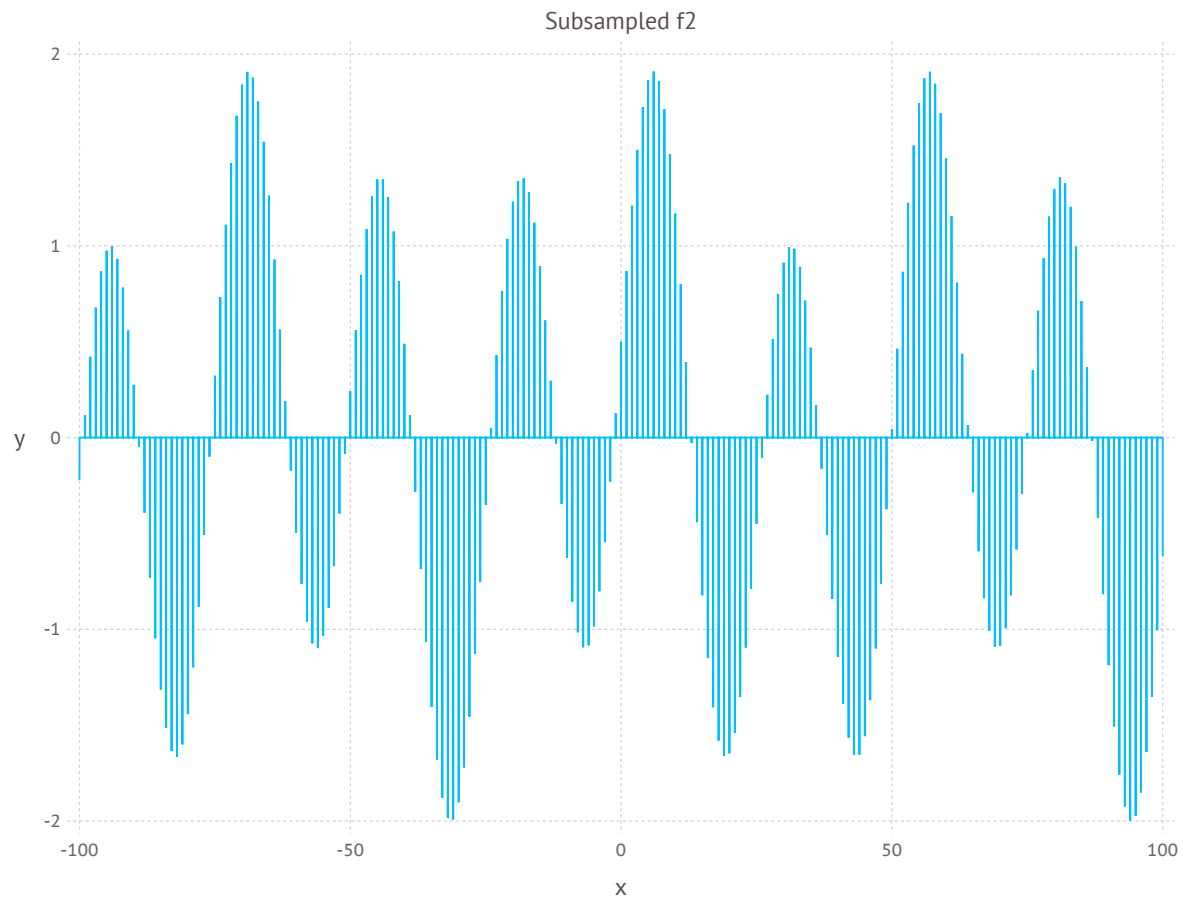
```
In [196]: plot(x=[-100:.005:100], y=f1,  
              Geom.line, Guide.title("Subsampled f1"))
```

Out[196]:



```
In [197]: plot(x=[-100:.005:100], y=f2,  
              Geom.line, Guide.title("Subsampled f2"))
```

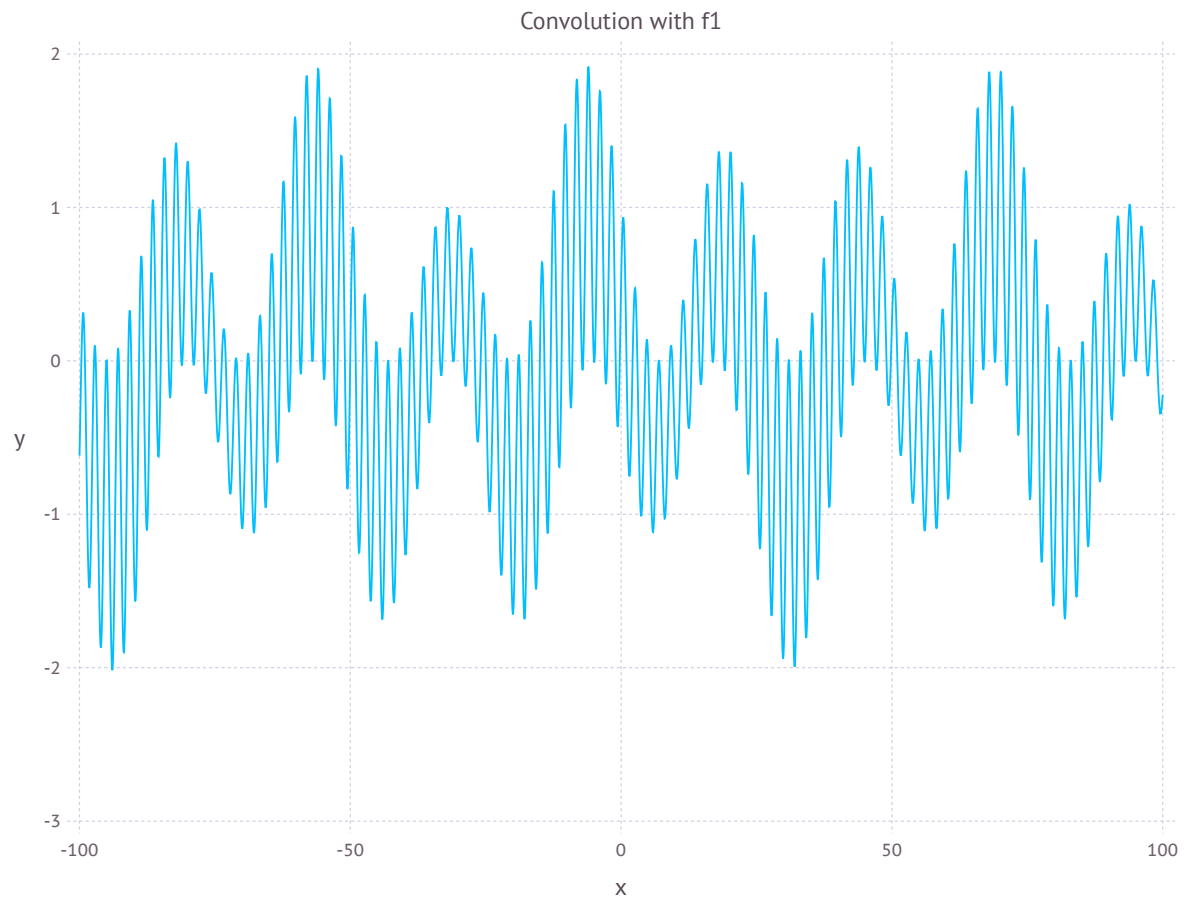
Out[197]:



Now the convolution with the sing function

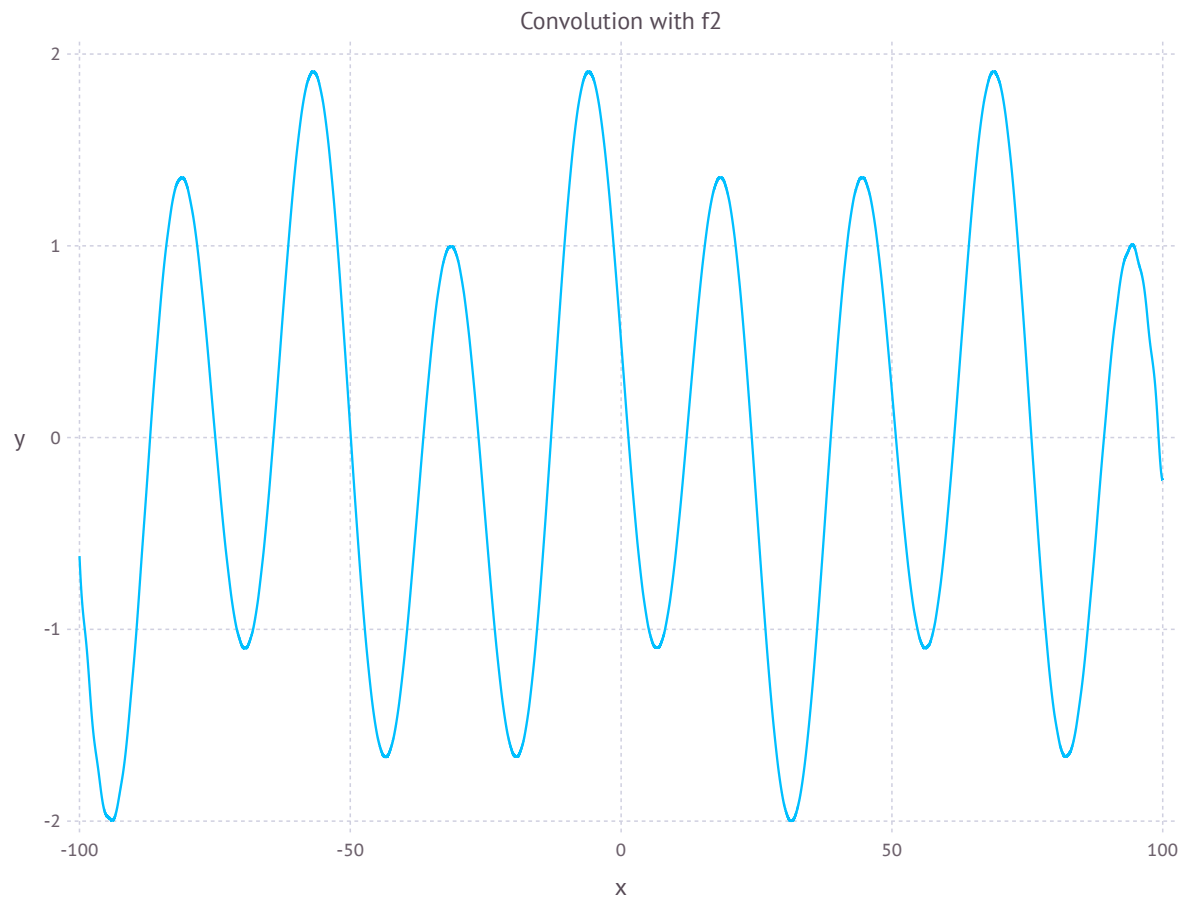
```
In [198]: plot(x=[-100:.005:100],y=imfilter(sinc([-100:.005:100]), f1),  
              Geom.line, Guide.title("Convolution with f1"))
```

Out[198]:



```
In [199]: plot(x=[-100:.005:100],y=imfilter(sinc([-100:.005:100]), f2),  
              Geom.line, Guide.title("Convolution with f2"))
```

Out[199]:



One can see that the recovery es better since the sampling in f1 is under the Nysquit rate.