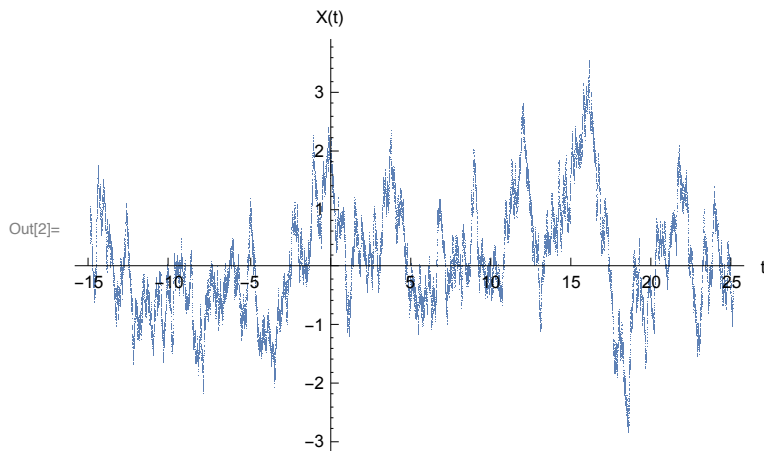


```

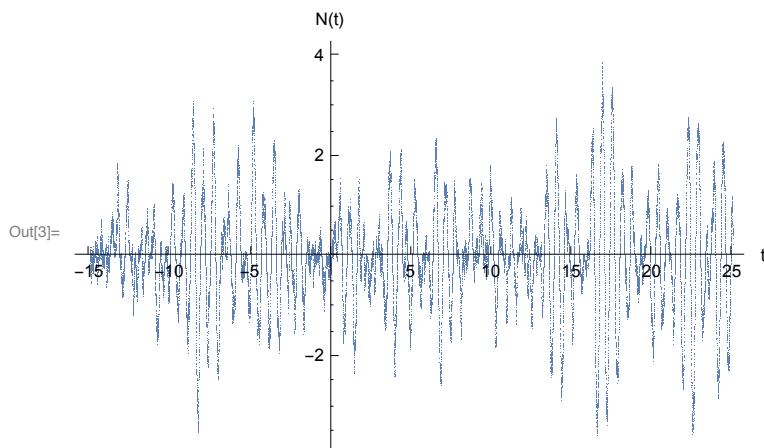
In[1]:= Clear[rep, X, Theta, No, Y, PlotX, PlotN, PlotY];
rep = 40 000;
For[i = 1;
  X = {Random[NormalDistribution[0, 1]]}, i ≤ rep, i++, X = Join[X, {Exp[-1 / 1000] *
    X[[i]] + Random[NormalDistribution[0, Sqrt[1 - Exp[-1 / 500]]]]}]];
For[i = 1;
  No = {Random[NormalDistribution[0, 1]]}, i ≤ rep, i++, No = Join[No, {Exp[-1 /
    1000] * No[[i]] + Random[NormalDistribution[0, Sqrt[1 - Exp[-1 / 500]]]]}]];
Theta = Random[UniformDistribution[{-Pi, Pi}]];
No = Table[Sqrt[2] * No[[i]] * Cos[Theta - 15 + 10 * (i - 1) / 1000], {i, 1, rep + 1}];
PlotX = ListPlot[X, Ticks -> {{1, "-15"}, {5001, "-10"}, {10 001, "-5"}, {15 001,
  "0"}, {20 001, "5"}, {25 001, "10"}, {30 001, "15"}, {35 001, "20"}, {40 001,
  "25"}}, Automatic, AxesLabel -> {"t", "X(t)"}, AxesOrigin -> {15 001, 0}];
PlotN = ListPlot[No, Ticks -> {{1, "-15"}, {5001, "-10"}, {10 001, "-5"}, {15 001,
  "0"}, {20 001, "5"}, {25 001, "10"}, {30 001, "15"}, {35 001, "20"}, {40 001,
  "25"}}, Automatic, AxesLabel -> {"t", "N(t)"}, AxesOrigin -> {15 001, 0}];
Y = X + No;
PlotY = ListPlot[Y, Ticks -> {{1, "-15"}, {5001, "-10"}, {10 001, "-5"}, {15 001,
  "0"}, {20 001, "5"}, {25 001, "10"}, {30 001, "15"}, {35 001, "20"}, {40 001,
  "25"}}, Automatic, AxesLabel -> {"t", "Y(t)"}, AxesOrigin -> {15 001, 0}];

```

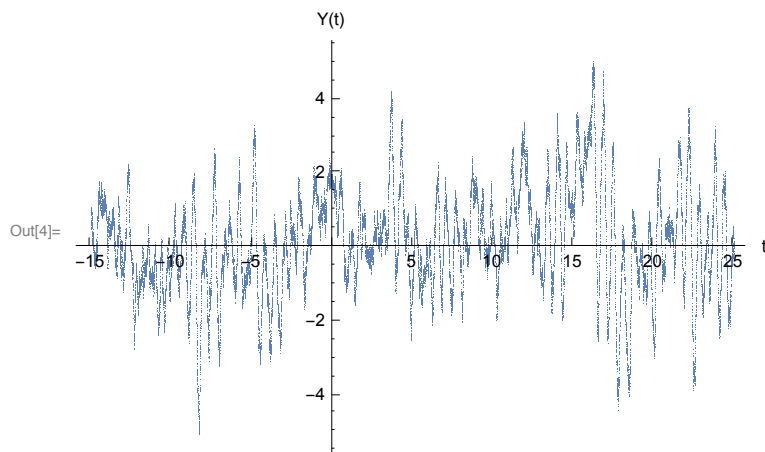
In[2]:= Show[PlotX]



In[3]:= Show[PlotN]



In[4]:= **Show[PlotY]**



In[5]:= **Clear[Sxx, Snn];**

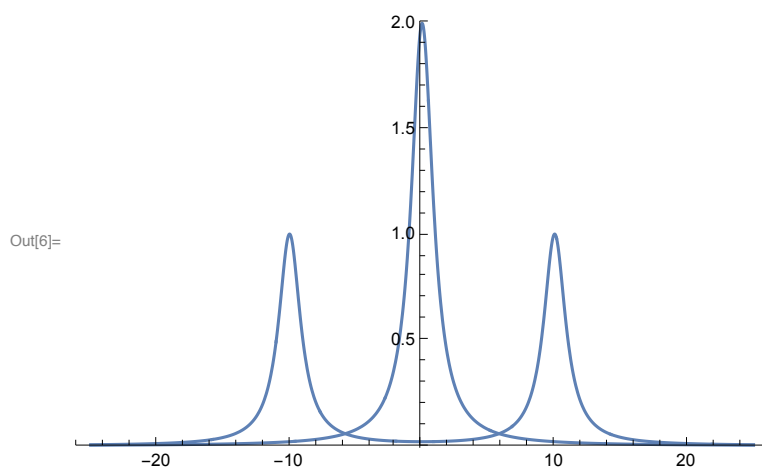
Sxx[omega_] := 2 / (1 + omega^2);

Snn[omega_] := (Sxx[omega - 10] + Sxx[omega + 10]) / 2;

Plot1 = Plot[Sxx[omega], {omega, -25, 25}, PlotRange -> {-0.01, 2.01}];

Plot2 = Plot[Snn[omega], {omega, -25, 25}, PlotRange -> {-0.01, 2.01}];

In[6]:= **Show[{Plot1, Plot2}]**



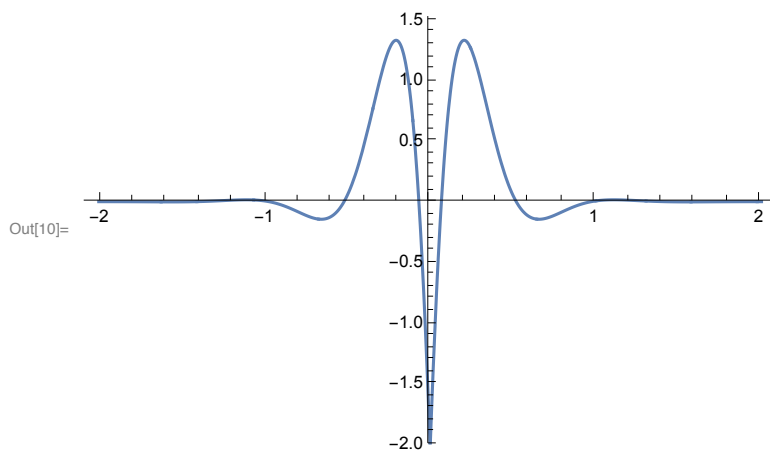
```
In[7]:= FullSimplify[
  FourierTransform[Sxx[omega] / (Sxx[omega] + Snn[omega]), omega, t] / Sqrt[2 * Pi]]
```

$$\text{Out[7]} = \sqrt{\frac{2}{\pi}} \left(\frac{1}{2} \sqrt{\frac{\pi}{2}} \text{DiracDelta}[t] + \right. \\ \left. \frac{1}{4 \sqrt{366}} 5 \left(\frac{1}{\sqrt{\frac{24-5 i \sqrt{183}}{\pi}}} \left(29 + 15 i \sqrt{183} \right) e^{t \text{Root}[5151+48 \#1^2+\#1^4\&,1]} \right. \right. \\ \left. \left. \left(e^{2 \sqrt{-24+5 i \sqrt{183}} t} \text{HeavisideTheta}[-t] + \text{HeavisideTheta}[t] \right) + \right. \right. \\ \left. \left. \frac{1}{\sqrt{\frac{24+5 i \sqrt{183}}{\pi}}} \left(29 - 15 i \sqrt{183} \right) \left(e^{t \text{Root}[5151+48 \#1^2+\#1^4\&,3]} \text{HeavisideTheta}[-t] + \right. \right. \right. \\ \left. \left. \left. e^{t \text{Root}[5151+48 \#1^2+\#1^4\&,2]} \text{HeavisideTheta}[t] \right) \right) \right) \right)$$

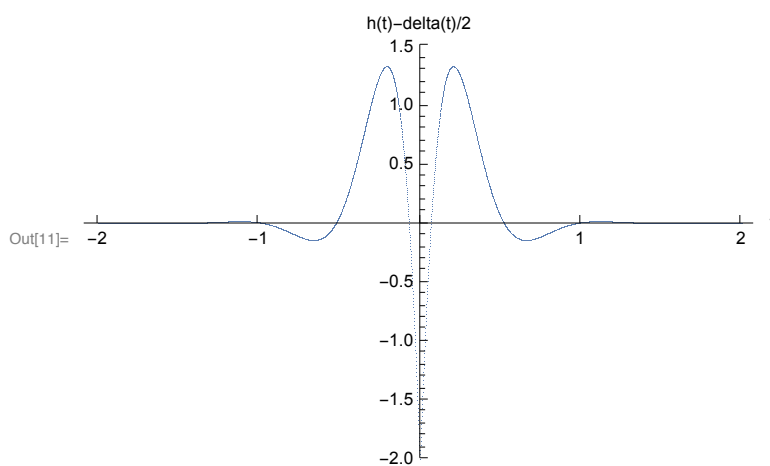
```
In[9]:= Clear[h2];
```

$$\text{h2}[t_]:= \text{Re} \left[\sqrt{\frac{2}{\pi}} \left(\frac{1}{4 \sqrt{366}} 5 \left(\left(29 - 15 i \sqrt{183} \right) \right. \right. \right. \\ \left. \left. \left. e^{t \text{Root}[5151+48 \#1^2+\#1^4\&,3]} \text{HeavisideTheta}[-t] \right) / \left(\sqrt{\frac{24+5 i \sqrt{183}}{\pi}} \right) + \right. \right. \\ \left. \left(\left(29 - 15 i \sqrt{183} \right) e^{t \text{Root}[5151+48 \#1^2+\#1^4\&,2]} \text{HeavisideTheta}[t] \right) / \right. \\ \left. \left(\sqrt{\frac{24+5 i \sqrt{183}}{\pi}} \right) + \frac{1}{\sqrt{\frac{24-5 i \sqrt{183}}{\pi}}} \left(29 + 15 i \sqrt{183} \right) e^{t \text{Root}[5151+48 \#1^2+\#1^4\&,1]} \right. \\ \left. \left. \left. \left(e^{t \text{Root}[82416+192 \#1^2+\#1^4\&,4]} \text{HeavisideTheta}[-t] + \text{HeavisideTheta}[t] \right) \right) \right) \right];$$

```
In[10]:= Plot[h2[t], {t, -2.01, 2.01}, PlotRange -> {-2.01, 1.51}]
```

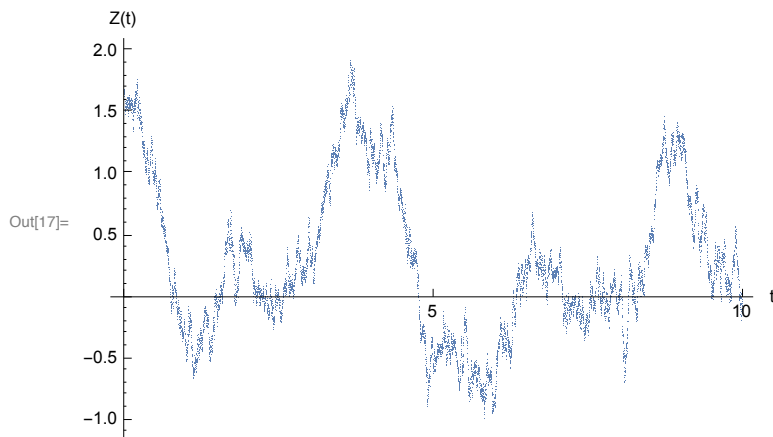


```
In[11]:= Clear[hh2];
hh2 = Table[N[h2[-2 + i / 1000]], {i, 0, 4000}];
ListPlot[hh2, Ticks -> {{1, "-2"}, {1001, "-1"}, {2001, "0"}, {3001, "1"},
    {4001, "2"}}, Automatic, AxesLabel -> {"t", "h(t)-delta(t)/2"},
    PlotRange -> {-2.01, 1.51}, AxesOrigin -> {2001, 0}]
```

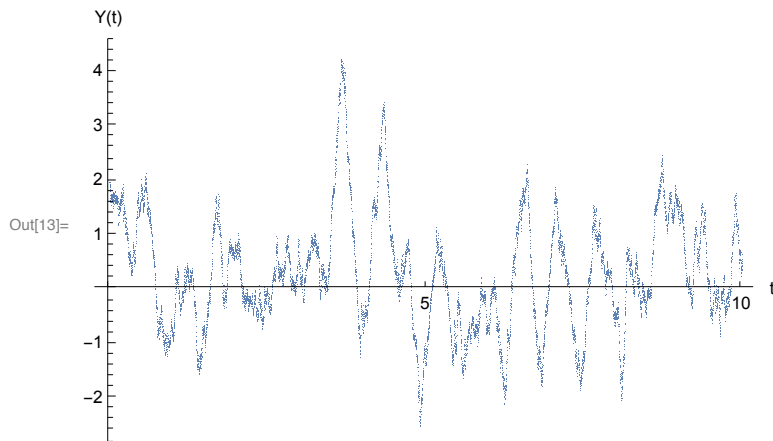


```
In[12]:= Clear[Z];
Z = Table[Sum[hh2[[i]] * Y[[j + 2000 - i]] / 1000, {i, 1, 2000}] + Sum[hh2[[i]] *
    Y[[j + 2000 - i]] / 1000, {i, 2002, 4000}] + Y[[j]] / 2, {j, 15001, 25001}];
```

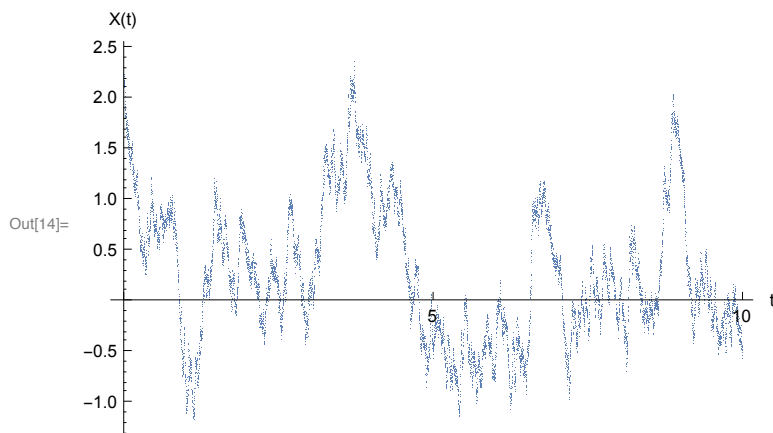
```
In[17]:= ListPlot[Z, Ticks -> {{1, "0"}, {5001, "5"}, {10 001, "10"}}, Automatic],  
          AxesLabel -> {"t", "Z(t)"}, AxesOrigin -> {1, 0}]
```



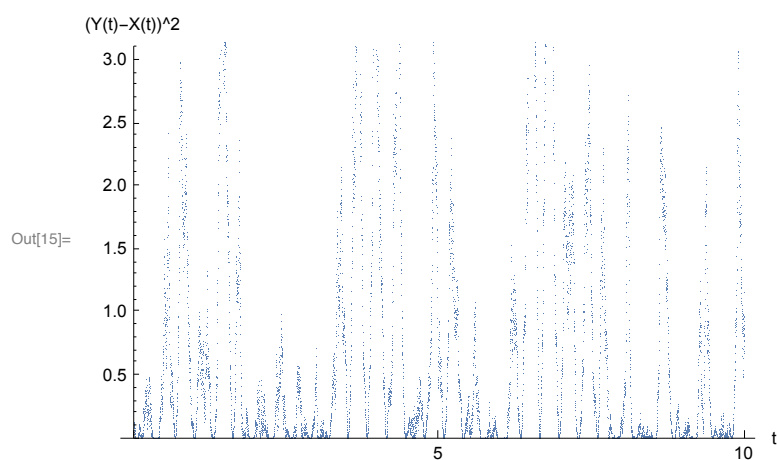
```
In[13]:= ListPlot[Table[Y[[j]], {j, 15 001, 25 001}],  
          Ticks -> {{1, "0"}, {5001, "5"}, {10 001, "10"}}, Automatic],  
          AxesLabel -> {"t", "Y(t)"}, AxesOrigin -> {1, 0}]
```



```
In[14]:= ListPlot[Table[X[[j]], {j, 15 001, 25 001}],  
          Ticks -> {{1, "0"}, {5001, "5"}, {10 001, "10"}}, Automatic],  
          AxesLabel -> {"t", "X(t)"}, AxesOrigin -> {1, 0}]
```



```
In[15]:= ListPlot[(Table[Y[[j]], {j, 15001, 25001}] - Table[X[[j]], {j, 15001, 25001}])^2,
  Ticks -> {{1, "0"}, {5001, "5"}, {10001, "10"}}, Automatic),
  AxesLabel -> {"t", "(Y(t)-X(t))^2"},
  AxesOrigin -> {1, 0}, PlotRange -> {-0.01, 3.11}]
```



```
In[16]:= ListPlot[(Z - Table[X[[j]], {j, 15001, 25001}])^2,
  Ticks -> {{1, "0"}, {5001, "5"}, {10001, "10"}}, Automatic),
  AxesLabel -> {"t", "(Z(t)-X(t))^2"},
  AxesOrigin -> {1, 0}, PlotRange -> {-0.01, 3.11}]
```

