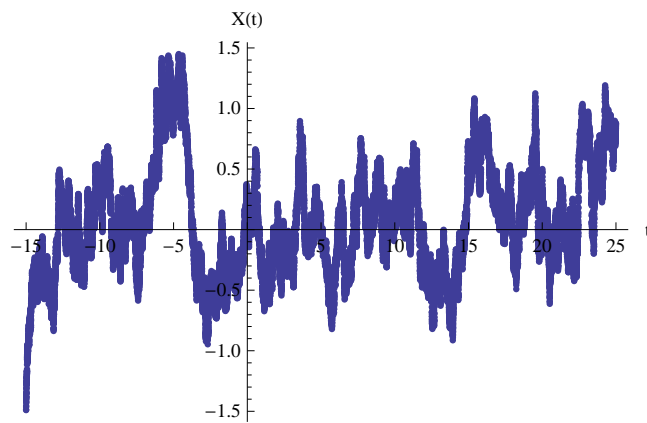


```

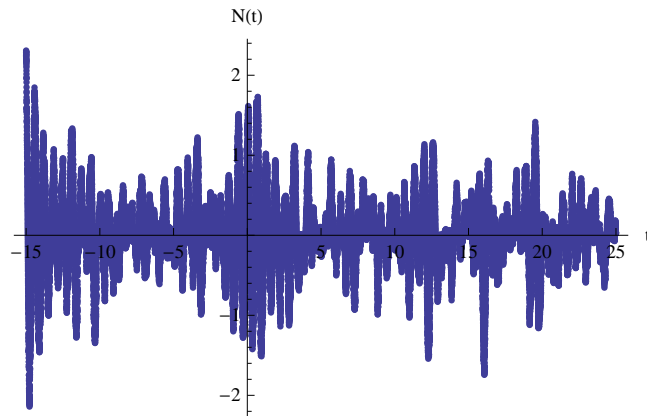
Clear[rep, X, Theta, No, Y, PlotX, PlotN, PlotY]; rep = 40 000;
For[i = 1; X = {Random[NormalDistribution[0, 1]]}, i ≤ rep, i++,
  X = Join[X, {Exp[-1 / 1000] * X[[i]] + Random[NormalDistribution[0, Sqrt[1 - Exp[-1 / 2000]]]}]];
For[i = 1; No = {Random[NormalDistribution[0, 1]]}, i ≤ rep, i++, No =
  Join[No, {Exp[-1 / 1000] * No[[i]] + Random[NormalDistribution[0, Sqrt[1 - Exp[-1 / 2000]]]}]];
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}];

```

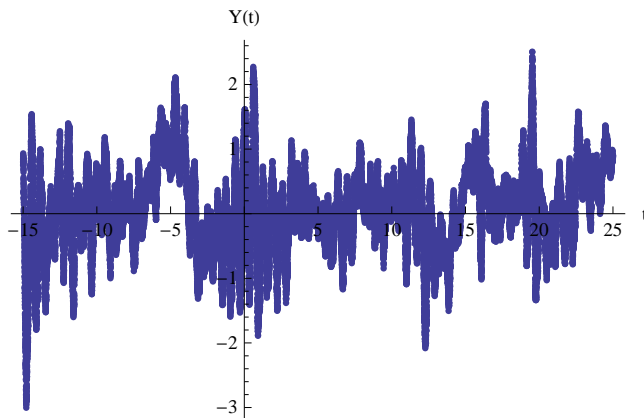
Show[PlotX]



Show[PlotN]

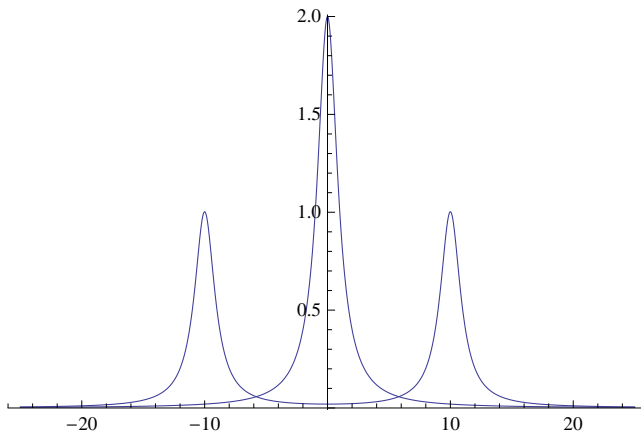


```
Show[PlotY]
```



```
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}];
```

```
Show[{Plot1, Plot2}]
```



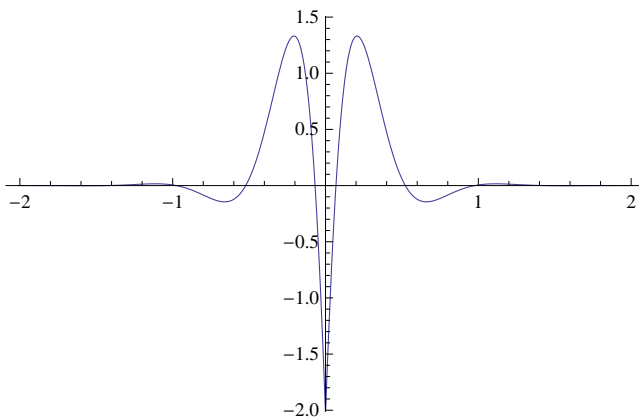
```
FullSimplify[FourierTransform[Sxx[omega] / (Sxx[omega] + Snn[omega]), omega, t] / Sqrt[2 * Pi]]
```

$$\sqrt{\frac{2}{\pi}} \left(\frac{1}{2} \sqrt{\frac{\pi}{2}} \text{DiracDelta}[t] + \frac{1}{4 \sqrt{366}} 5 \left(\frac{(29 - 15 i \sqrt{183}) e^{t \text{Root}[5151+48 \#1^2+\#1^4,3]}}{\sqrt{\frac{24+5 i \sqrt{183}}{\pi}}} \text{HeavisideTheta}[-t] + \frac{(29 - 15 i \sqrt{183}) e^{t \text{Root}[5151+48 \#1^2+\#1^4,2]}}{\sqrt{\frac{24+5 i \sqrt{183}}{\pi}}} + \frac{1}{\sqrt{\frac{24-5 i \sqrt{183}}{\pi}}} (29 + 15 i \sqrt{183}) e^{t \text{Root}[5151+48 \#1^2+\#1^4,1]} \left(e^{t \text{Root}[82416+192 \#1^2+\#1^4,4]} \text{HeavisideTheta}[-t] + \text{HeavisideTheta}[t] \right) \right) \right)$$

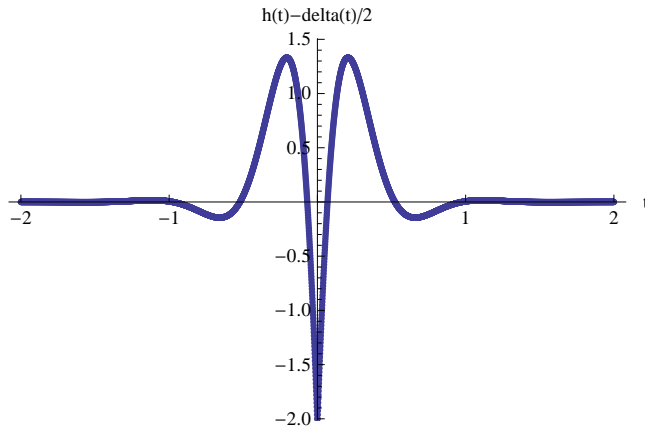
```
Clear[h2];
```

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

```
Plot[h2[t], {t, -2.01, 2.01}, PlotRange -> {-2.01, 1.51}]
```

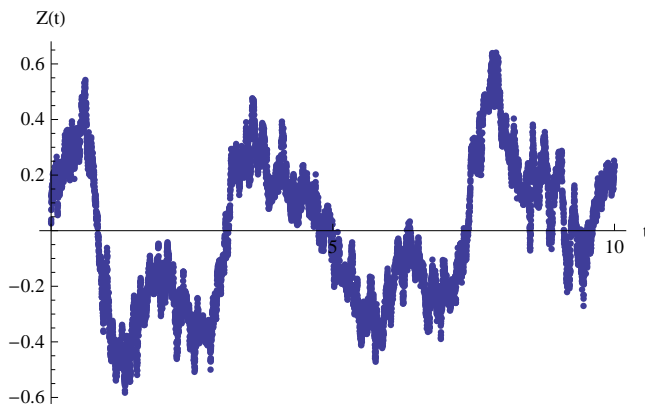


```
Clear[hh2]; hh2 = Table[N[h2[-2 + i / 1000]], {i, 0, 4000}]; ListPlot[hh2,
  Ticks -> {{1, "-2"}, {1001, "-1"}, {2001, "0"}, {3001, "1"}, {4001, "2"}}, Automatic,
  AxesLabel -> {"t", "h(t)-delta(t)/2"}, PlotRange -> {-2.01, 1.51}, AxesOrigin -> {2001, 0}]
```

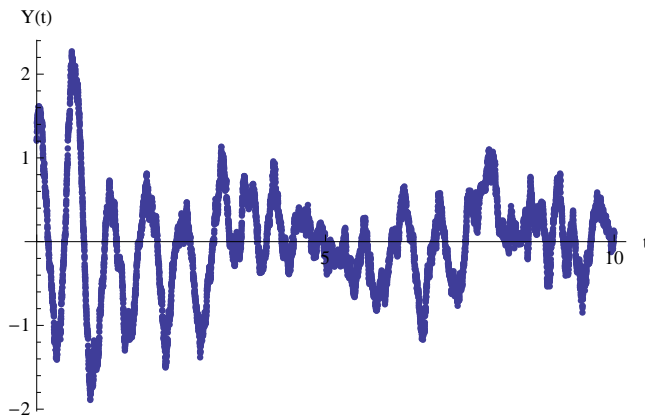


```
Clear[Z]; Z = Table[Sum[hh2[[i]] * Y[[j + 2000 - i]] / 1000, {i, 1, 2000}] +
  Sum[hh2[[i]] * Y[[j + 2000 - i]] / 1000, {i, 2002, 4000}] + Y[[j]] / 2, {j, 15001, 25001}];
```

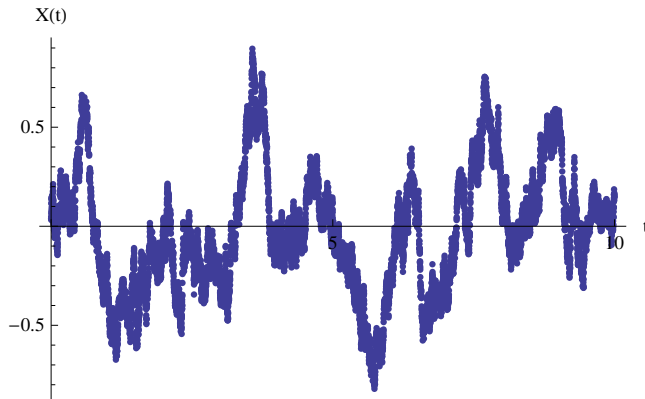
```
ListPlot[Z, Ticks -> {{1, "0"}, {5001, "5"}, {10001, "10"}}, Automatic,
  AxesLabel -> {"t", "Z(t)"}, AxesOrigin -> {1, 0}]
```



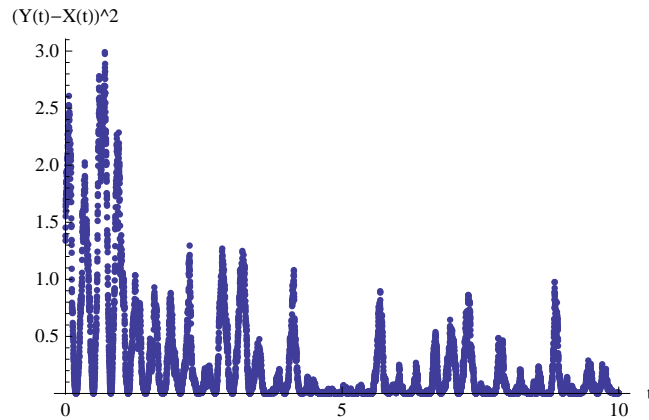
```
ListPlot[Table[Y[[j]], {j, 15001, 25001}],
  Ticks -> {{1, "0"}, {5001, "5"}, {10001, "10"}}, Automatic,
  AxesLabel -> {"t", "Y(t)"}, AxesOrigin -> {1, 0}]
```



```
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}]
```



```
ListPlot[(Table[Y[[j]], {j, 15 001, 25 001}] - Table[X[[j]], {j, 15 001, 25 001}])^2,
  Ticks -> {{{1, "0"}, {5001, "5"}, {10 001, "10"}}, Automatic},
  AxesLabel -> {"t", "(Y(t)-X(t))^2"}, AxesOrigin -> {1, 0}, PlotRange -> {-0.01, 3.11}]
```



```
ListPlot[(Z - Table[X[[j]], {j, 15 001, 25 001}])^2,
  Ticks -> {{{1, "0"}, {5001, "5"}, {10 001, "10"}}, Automatic},
  AxesLabel -> {"t", "(Z(t)-X(t))^2"}, AxesOrigin -> {1, 0}, PlotRange -> {-0.01, 3.11}]
```

