Let \( \{X(t), t \in T\} \) be a random process. If, for any \( \alpha_1, \alpha_2, \ldots, \alpha_n \) and \( t_1, t_2, \ldots, t_n \),

\[
\alpha_1 X(t_1) + \alpha_2 X(t_2) + \cdots + \alpha_n X(t_n)
\]

is a Gaussian distributed random variable, then \( \{X(t), t \in T\} \) is said to be a Gaussian, or normal, process.

It follows, that for a Gaussian process, weakly stationarity is equivalent to strong stationarity.
A normal process \( \{X(t), t \geq 0\} \) is a Wiener process, or a Brownian motion, with variance \( \sigma^2 \), if

- \( X(0) = 0 \), and

- the process has independent increments, and

- the increment \( X(t + h) - X(t) \) is normal distributed with mean 0 and variance \( h\sigma^2 \).
Repetition
Let \( \{X(t), t \in \mathbb{R}\} \) be a Gaussian random process with mean \( m \) and covariance function \( r_X(\tau) = e^{-\tau^2/2} \). Compute \( \mathbb{P}(X(t + 0.5) - X(t - 0.5) > 1) \).
The transfer function
The transfer function

\[ |H(f)|^2 \]
Let a time continuous Gaussian process \( \{X(t), t \in \mathbb{R}\} \) with expected value 1 and spectral density

\[
R_X(f) = \begin{cases} 
1 + |f| & |f| \leq 1 \\
0 & \text{otherwise}
\end{cases}
\]

be the input to a linear filter with frequency function \( H(f) \):

\[
H(f) = \begin{cases} 
\frac{2}{1+|f|} & |f| \leq 1 \\
0 & \text{otherwise}.
\end{cases}
\]

Denote the output with \( \{Y(t)\} \) and determine \( P(Y(t) \leq 4) \).