$\boxed{4.22}$ Using the GUI module *f_correlate* select the white noise input. Set the scale factor for y to $c = 0$.

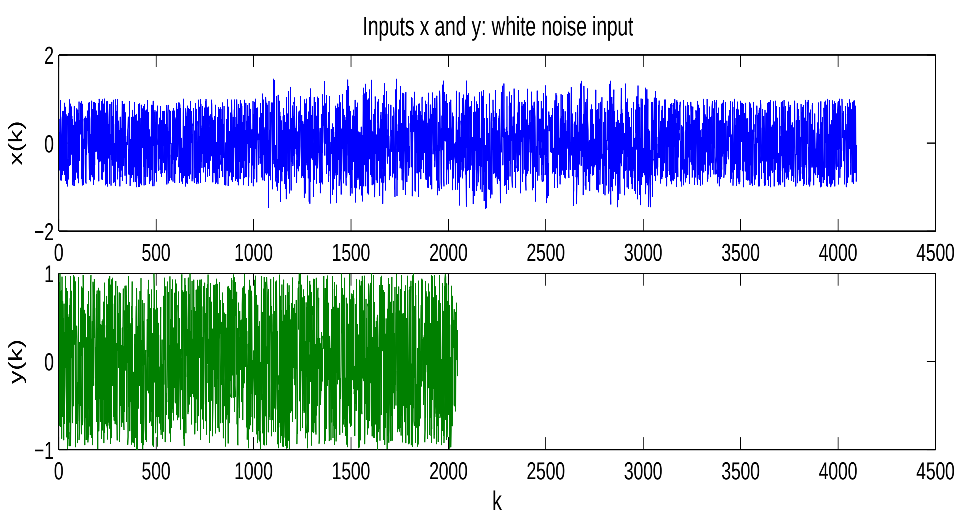
(a) Plot $x(k)$ and $y(k)$. What is the range of values over which the uniform white noise is distributed?

(b) Verify that $r_{xx}(k) \approx P_x \delta(k)$ by plotting the auto-correlation of $x(k)$.

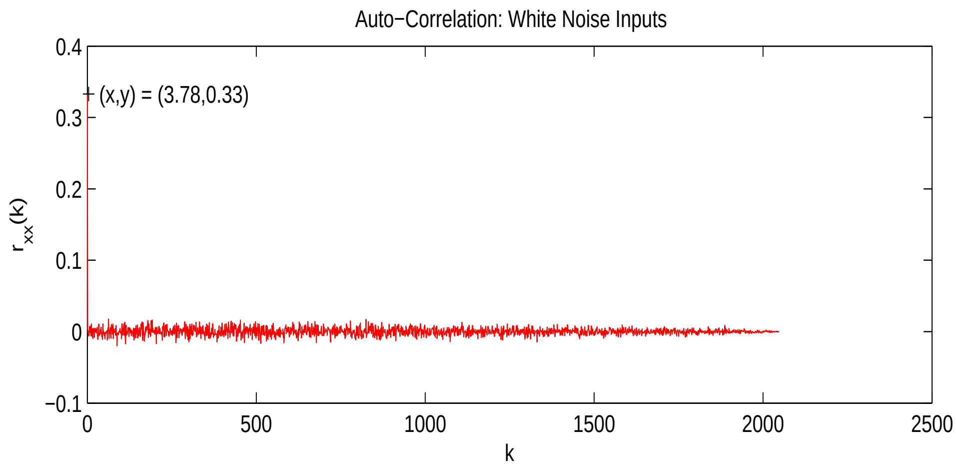
(c) Use the Caliper option to estimate P_x.

(d) Verify that this estimate of P_x is consistent with the theoretical value, P_u, in (3.6.7).

Solution



(a) The noise is distributed over $[-1, 1]$.



(b)

(c) From the Caliper measurement in part (b), the estimated average power of the white noise input $x(k)$ is

$$P_x \approx 0.33$$

(d) From (3.6.7) and the results from part (a), the predicted average power of the uniformly distributed white noise is

$$\begin{aligned} P_u &= \frac{b^3 - a^2}{3(b-a)} \\ &= \frac{(1)^3 - (-1)^3}{3[1-(-1)]} \\ &= \frac{1}{3} \end{aligned}$$