

$$y(n) = x(n) + \frac{1}{2} y(n-1)$$

$$y(n) = 1_{x(n)} + \frac{1}{2} x(n) + \frac{1}{4} x(n-2) + \dots$$

$$x(n-k) \Rightarrow z^{-k}$$

$$Y(z) = 1z^0 + \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2} + \dots$$

$$Y(z) - \frac{1}{2}z^{-1}Y(z) = 1z^0 + \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2} - \left( \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2} \right)$$

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$$1z^0$$

$$Y(z) - \frac{1}{2}z^{-1}Y(z) = 1$$

$$Y(z) \left( 1 - \frac{1}{2}z^{-1} \right) = 1$$

$$Y(z) = \frac{1}{1 - \frac{1}{2}z^{-1}}$$