Example 2.16

$$X(z) = \frac{z(1-e^{-aT})}{(z-1)(z-e^{-aT})}$$

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$$z^{-1}(X(z))$$

Solution 2 simple poles

$$x(kT) = k_1 + k_2 = 1 - e^{-akT}, \quad k = 0, 1, 2 \cdots$$

$$k_1 = \lim_{z \to 1} (z-1) \frac{z(1-e^{-aT})}{(z-1)(z-e^{-aT})} z^{k-1}$$

$$= \lim_{z \to 1} \frac{z^{k-2}(1-e^{-aT})}{z-e^{-aT}}$$

$$= 1$$

$$k_2 = \lim_{z \to e^{-aT}} (z-e^{-aT}) \frac{z(1-e^{-aT}) z^{k-1}}{(z-1)(z-e^{-aT})}$$

$$= \frac{(e^{-aT})^k (1-e^{-aT})}{e^{-aT}-1} = -e^{-akT}.$$