2.21. 仅求收敛域.

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(1). $x(n)=\begin{cases}\underline{6}.\ 7.\ -3 \\ 0 \quad , \text{other}.\end{cases}$

$$X(z)=\sum_{n=-\infty}^{\infty} x(n)\cdot z^{-n} = 6\cdot z^{-0}+7\cdot z^{-1}-3\cdot z^{-2}=6+\frac{7}{z}-\frac{3}{z^2}$$

∴ 显然收敛域为 $0<|z|\leq+\infty$.

(2). $x(n)=\begin{cases}(\frac{1}{2})^n & n\geq 5 \\ 0 & n\leq 4.\end{cases}$

$$X(z)=\sum_{n=-\infty}^{\infty} x(n) z^{-n} = (\tfrac{1}{2})^5\cdot z^{-5}+(\tfrac{1}{2})^6\cdot z^{-6}+\cdots+(\tfrac{1}{2})^n\cdot(z)^{-n}.$$

$$=\sum_{n=5}^{\infty}(\frac{1}{2z})^n = \frac{(\frac{1}{2z})^5(1-(\frac{1}{2z})^n)}{1-\frac{1}{2z}}$$

显然是否收敛依靠 $1-(\frac{1}{2z})^n$ 与分母 $1-\frac{1}{2z}$.

则易知收敛域为 $\frac{1}{2}<|z|\leq\infty$.

(4). $x(n)=2^{-n}u(n)$.

$$X(z)=\sum_{-\infty}^{\infty} x(n) z^{-n} = \sum_{0}^{\infty} 2^{-n} z^{-n} = 2^0 z^0+2^{-1}z^{-1}+\cdots+2^{-n}z^{-n}$$

$$=\frac{1[1-(\frac{1}{2z})^n]}{1-2^{-1}z^{-1}}$$ 收敛条件为 $\frac{1}{2z}\leq 1$ 且 $1-2^{-1}z^{-1}\neq 0$

∴ 收敛域为 $|z|>\frac{1}{2}$.

(7). $x(n)=R_N(n)$. $N=4$.

$$X(z)=\sum_{-\infty}^{\infty} x(n) z^{-n} = \sum_{0}^{3} z^{-n} = 1+\frac{1}{z}+\frac{1}{z^2}+\frac{1}{z^3}.$$

显然收敛域为 $0<|z|\leq\infty$.

$X(z)=\sum_{n_1}^{n_2} x(n) z^{-n}$.

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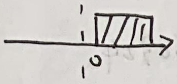
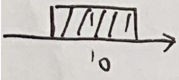
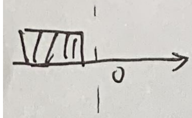
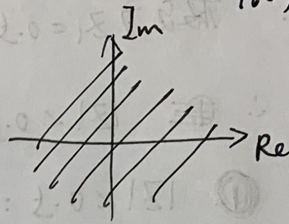
①. 有限长序列：

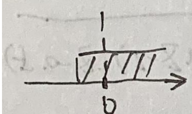

1°. $0 \le n_1 < n_2$. $0 < |z| \le \infty$.

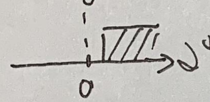

2°. $n_1 < 0 < n_2$ $0 < |z| < \infty$.

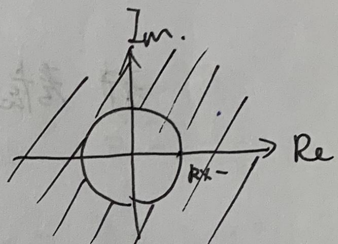

3°. $n_1 < n_2 \le 0$. $0 \le |z| < \infty$.

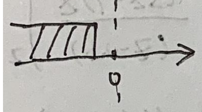


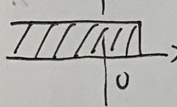
②. 无限长序列，单边序列．

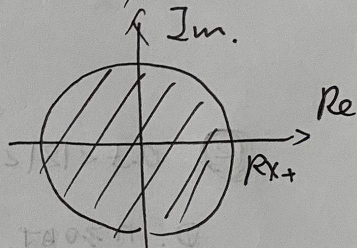

1°. $n_1 \le 0$. $n_2 \Rightarrow \infty$ $R_{x-} < |z| < \infty$.


2° $n_1 \ge 0$ $n_2 \Rightarrow \infty$. $R_{x-} < |z| \le \infty$.

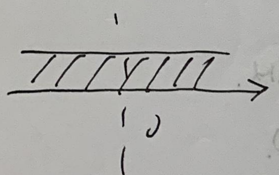



3°. $n_1 \Rightarrow -\infty$ $n_2 < 0$. $0 \le |z| < R_{x+}$.


4°. $n_1 \Rightarrow -\infty$ $n_2 \ge 0$. $0 < |z| < R_{x+}$



③. 双边序列：


$n_1 \Rightarrow -\infty$ $n_2 \Rightarrow +\infty$. $R_{x-} < |z| < R_{x+}$.