

3rd Exercise in Digital Information Processing

1. Compute the inverse Z-transform of the function:

$$X(z) = \frac{z-1}{z-2}, \quad |z| > 2.$$

- Use example 3.5 (page 44) in the book and properties of the Z-transform.
- Use the residue theorem.

2. Compute the inverse Z-transform of

$$F(z) = \frac{1}{z^3(2z-1)}.$$

- Use the residue theorem. Additionally compute the inverse Z-transform for the case $n < 4$ by using the $1/z$ -inversion formula (p. 53) and the residue theorem.
- Use properties of the Z-transform and the relation

$$X(z) = \frac{1}{(z-z_\infty)}, \quad |z| > |z_\infty| \Leftrightarrow x[n] = u[n-1]z_\infty^{n-1}$$

(Where $u[n]$ is the unit step function).

3. Compute the inverse Z-transform of $F(Z)$.

$$F(z) = \frac{z}{(z+0.5)^2(z-1)}$$

Use partial fraction decomposition and the following property of the Z-transform:

$$X(z) = \frac{1}{(z-z_0)^k} \Leftrightarrow x[n] = u(n-k) \binom{n-1}{k-1} z_0^{n-k}, \quad |z| > |z_0|$$