## ECE113, Winter 2023

Quiz #17

Digital Signal Processing

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Wednesday, 15 March 2023 10 points total.

Name:	
UID:	

1. (10 points) You are given the following Z-transform pairs and properties:

Mini Z-transform table				
Time-domain: x[n]	Frequency Do	omain: X(z)	ROC: $R_x$	
$\alpha^n u[n]$	$\frac{1}{1-\alpha z^{-1}}$		$ z  >  \alpha $	
$-\alpha^n u[-n-1]$	$\frac{1}{1-\alpha z^{-1}}$	X Y	$ z  <  \alpha $	
$x[n-n_o]$	$z^{-n_o}X(z)$		$R_x, \text{ except } z = 0$ if $n_o > 0$	
		X Y	if $n_o > 0$	

Find the inverse Z-transform of the following transform:

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

## Solution:

To get the inverse Z-transform using the table, we have to get X(z) into the form of one of the transform pairs.

$$X(z) = 2 \cdot z^{-2} \cdot \frac{1}{1 - \frac{1}{2}z^{-1}} = 2 \cdot z^{-2} \cdot G(z)$$
 (2)

The last term is clearly the Z-transform for the first pair in the table, given the ROC. Then we can use this information along with the time-shifting property to get the final answer:

$$x[n] = 2 \cdot g[n-2] = 2 \cdot \left(\frac{1}{2}\right)^{n-2} \cdot u[n-2] = \left(\frac{1}{2}\right)^{n-3} u[n-2]$$
 (3)