ECE113, Winter 2023 **Quiz #10**
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Monday, 13 Feb 2023
10 points total.

Name: _____
UID: _____

1. (10 points) Determine the **DTFT** of

$$y[n] = \alpha^n(u[n-1] - u[n-4]), |\alpha| < 1.$$

Solution:

$y[n] = \alpha^n(u[n-1] - u[n-4])$. Let $x[n] = \alpha^n u[n]$ with $|\alpha| < 1$. Its DTFT was computed in Lecture 8 and is given by $X(\Omega) = \frac{1}{1-\alpha e^{-j\Omega}}$. Now $y[n] = \alpha x[n-1] - \alpha^4 x[n-4]$. Using the time-shifting property of the DTFT given in CYU#2 in Lecture 8, the DTFT of $y[n]$ is thus given by

$$Y(\Omega) = \alpha e^{-j\Omega} X(\Omega) - \alpha^4 e^{-j4\Omega} X(\Omega) = \frac{\alpha e^{-j\Omega} - \alpha^4 e^{-j4\Omega}}{1 - \alpha e^{-j\Omega}}$$