Hw 3 Nov. 26, '15

Answers without justifications will not be given credits

1. Let $h(n) = (\frac{1}{2})^n u(n) + (\frac{1}{3})^n u(n)$ be the impulse response of an LTI system, the input be $x(n) = \delta(n) - \frac{1}{3}\delta(n-1)$ and the output be $y(n)$.
   (a) Determine $H(z)$ and its ROC.
   (b) Plot the pole-zero diagram of $H(z)$.
   (c) Determine the stability of the system from the location of it poles and ROC.
   (d) Find $Y(z)$ and its ROC.
   (e) Apply inverse z-transform on $Y(z)$ to obtain $y(n)$.
   (f) Find an input $x(n)$ such that the output has finitely many nonzero samples.

2. Let $h(n)$ be the impulse response of an 8-point moving average system.
   (a) Determine $H(z)$ and its ROC.
   (b) Plot pole-zero diagram of $H(z)$.

3. *Let $h(n)$ be the impulse response of an LTI system with z-transform $H(z) = \sum_{n=0}^{L} h(n)z^{-n}$ and $h(n)$ is complex in general. Suppose $H(z)$ has zeros z_1, $z_2, \cdots, z_L$. Let $g(n) = h^*(n)$.
   (a) Express $G(z)$ in terms of $H(z)$. Determine the zeros of $G(z)$.
   (b) What can we say about the zeros of $H(z)$ when $h(n)$ is real?