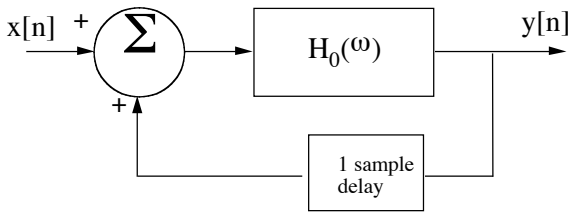
EE 438 Digital Signal Processing with Applications
Homework #3 due 9/14/2007

1. A LTI system with frequency response $H(e^{j\omega})$ has input $\cos(\omega_o n)$. Derive a simple expression for the output of the system. Repeat for input $\sin(\omega_o n)$.

2. Consider the system shown below where the filter is described by the difference equation $y[n] = \left(x[n] - y[n-1]\right)/2$:



   a. Find a difference equation that describes the overall system.

   b. Find an expression for the frequency response $H(\omega)$ of the overall system in terms of $H_0(\omega)$, the frequency response of the filter.

   c. Find the actual frequency response $H(\omega)$ from your answer to part a. and also using your answer to part b. Verify that the two approaches lead to the same answer.