Hints for problem 1 of Hmwk #6

Hint 1

It can save you some time if you first read pages 69-74 of the class handwritten notes and notice the similarities with the systems shown there. If you get confused with the $Z^{-\frac{1}{2}}$ term suggested in the problem statement, just ignore it and work with the z-transform corresponding to the $T/2$ sampling period, for that you'll have to *upsample* by 2 the z-transform of the signal input to the DAC.

Hint 2

When you try to find the step response of the system with double the sampling frequency as asked in the problem, you may find useful the following partial fraction expansion:

$$\frac{1}{1-az^{-2}}\frac{1}{1-bz^{-1}} = \frac{(1-ab^{-2})^{-1}}{1-bz^{-1}} + \frac{(1-\frac{b^2}{a})^{-1}(1+bz^{-1})}{(1-az^{-2})}$$