Exercise 2

1. Suppose you have a mechanical clock that has a minute hand, but no hour hand. You take a photograph of the clock when the minute hand points at 12:00 AM and then take additional photos every 55 minutes. Upon showing those photos, in time order, to someone:
   (a) What would that person think about the direction of motion of the minute hand as time advances?
   (b) How often would you take photos, measured in photos/hour so that the successive photos show proper (true) clockwise minute-hand rotation?
2. Assume we sampled a continuous $x(t)$ signal and obtained 100 time domain samples. What important parameter is missing in order to analyze $x(t)$?
3. Consider a continuous time-domain sine wave whose cyclic frequency is 1000Hz, which is defined by $x(t) = \cos(2 \cdot \pi \cdot 1000t + \pi/7)$.
   (a) Write the equation for the discrete x(n) sequence at sampling frequency 4000Hz.
   (b) Write the equation for the discrete x(n) sequence at sampling frequency 1500Hz.
4. A signal $x(t) = \cos(2 \cdot \pi \cdot 400t)$ is sampled at the sampling rate $f_s = 2000Hz$. The sampled signal $x(n)$ can be expressed as a sum of a positive rotating and a negative rotating pointer.
   (a) How many samples does it take for the pointers to make a full rotation?
   (b) How many radians will the pointers change from one sample to the next?