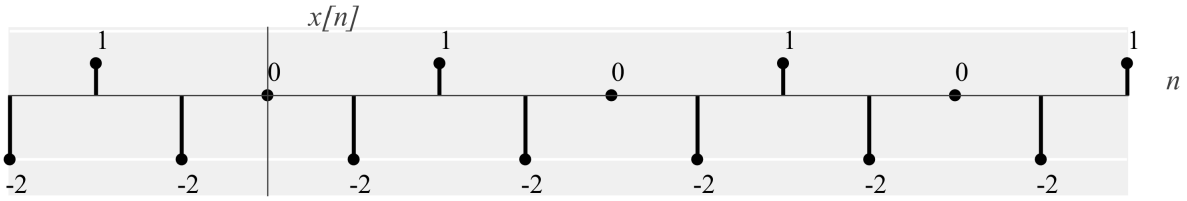
Full Name: _____ **Lab Section:** _____

ECE 3500 (Fall 2016) – Examples #2

Question #1: Consider the discrete-time signal $x[n]$ below. **Assume the periodic pattern shown in the plot continues forever to $n \to -\infty$ and $n \to \infty$.**



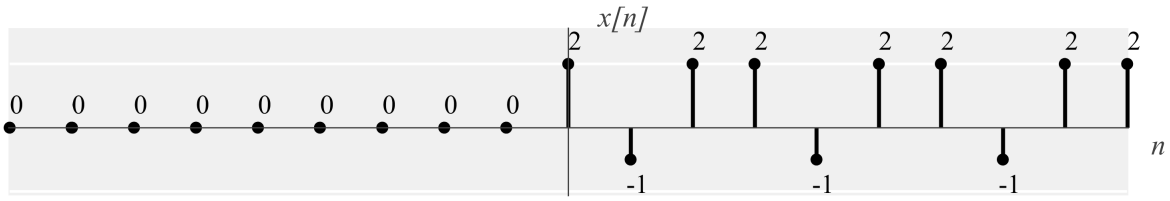
(a) Determine the fundamental period of $x[n]$.

(b) Compute the energy of $x[n]$.

(c) Compute the average power of $x[n]$.

(d) Is $x[n]$ causal? Also, is $x[n]$ even, odd, or neither?

Question #2: Consider the following signal $x[n]$. Assume the periodic pattern shown in the plot continues forever for $n \geq 0$. Also assume the zeros continue forever for $n < 0$.



(a) Express this signal (the entire signal) using step functions and/or impulse functions.

(b) The signal $y[n] = x[n] + x[?]$ is periodic. Determine a ? so that this statement is true.

(c) Determine the fundamental period of $y[n]$.

Question #3: Let $x_1(t)$, $x_2(t)$, and $x_3(t)$ be periodic signals with fundamental periods of 1, 3, and 10, respectively. Also let $x_1(t)$, $x_2(t)$, and $x_3(t)$ have powers of 1, 2, and 3, respectively.

(a) Compute the fundamental period of $z(t) = x_1(t) + x_2(t) + x_3(t)$

(b) Based on our knowledge, can we compute the power of $z(t)$? If so, what is the power? If not, why?

Question #4: Consider the following signals. Determine if each signal is periodic. If it is, determine its fundamental period.

(a) *(2 pts)* $x(t) = 2\cos(6t + 3) + 1$

(b) *(2 pts)* $x[n] = \sin(3n) + \sin(2n)$

(c) *(3 pts)* $x(t) = \cos\left(\frac{\pi}{10}t\right) + 3\cos\left(\frac{\pi}{20}t\right) + 4\sin\left(\frac{\pi}{30}t\right)$

(d) *(3 pts)* $x[n] = (-1)^n$