Problem 1. For each discrete-time (DT) signal below, sketch signal $x$ as a function of $n$ by hand, i.e. do not use software. Carefully label the plots.

(a) $x[n] = 12\delta[n - 5]$, $1 < n < 10$
(b) $x[n] = 4\delta[n]$, $-10 < n < 10$
(c) $x[n] = 2\delta[n + 3]$, $-8 < n < 5$
(d) $x[n] = \cos(\pi n/2)$.

Problem 2. For each of the following signals, determine whether or not it is periodic. If the signal is periodic, determine its fundamental period.

(a) $x[n] = \sin(\pi n/3) + \cos(\pi n/2)$
(b) $x(t) = e^{(\pi jt)}$
(c) $x[n] = \sin(6\pi n/7 - 1)$

Problem 3. Compute and sketch the discrete-time convolutions $x * h$ for given signals $x[n] = u[n]$ and $h[n] = n \cdot u[n]$.

Problem 4. Two signals $x[n]$ and $h[n]$ are given as the following: $h[n] = \{h[0], h[1], h[2]\}$ and $x[n] = \{x[0], x[1], x[2], x[3]\}$.

(a) Calculate $y[n]$ as convolution of signals $h[n]$ and $x[n]$.
(b) When $h[n] = \{1, 1, 1\}$ and $x[n] = \{1/2, 1/2, 1/2, 1/2\}$ calculate $y[n]$ by “graphical convolution”.

Problem 5. Given is the continuous signal $x(t) = \sin(2\pi f_0 t + \pi/6)$. When frequency $f_0 = 300$ Hz, and sampling frequency $f_s = 8$ kHz, perform sampling of signal $x(t)$ at time interval 0-1 ms. Plot, next to each other, graphs of the continuous and discrete signals.

Problem 6. A continuous signal $x(t) = \cos(2\pi f_0 t)$ is given. When sampling frequency is $f_s = 8$ kHz, sample the continuous signal at time interval 0-1 ms, for $f_0 \in \{100, 225, 350, 475\}$ Hz. Plot next to each other, graphs of the continuous and discrete signals.