1. A time domain real-signal `x(t)` has a Fourier Transform property of `X(ω)= X*(-ω)`. Consider the following frequency domain description of a signal `G(ω)`:

$$G(\omega) = \begin{cases} 2, 5 \le |\omega| \le 10 \\ 0, \text{elsewhere} \end{cases}.$$

   (a) Evaluate `g(t)` using the definition of Inverse Fourier Transformation $\left(g(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} G(\omega) e^{j\omega t}\, d\omega \right)$
   Plot `G(ω)`, `Re(g(t))`, and `Im(g(t))` in a 3x1 subplot for the interval `ω=-31.4:0.01:31.4` and `t=-100:0.1:100`.
   (b) Now consider `Y(ω)=G(ω-5)`. Plot `Y(ω)`, `Re(y(t))`, and `Im(y(t))` in a 3x1 subplot with the same intervals.
   (c) Are `g(t)` and `y(t)` real-signal or complex signal?

2. When the signal `g(t)` goes through a filter `h(t)` where the frequency domain definition of the filter is:

$$H(\omega) = \begin{cases} 5|\omega|, |\omega| \le 20 \\ 0, \text{elsewhere} \end{cases},$$

   the results in a time domain output signal: `m(t)`.
   (a) Using convolution theorem, calculate the frequency domain output signal `M(ω)`. Plot the magnitude and phase of `M(ω)` in a 2x1 subplot for the interval `ω=-31.4:0.01:31.4`.
   (b) Evaluate `m(t)` using the definition of Inverse Fourier Transformation. Plot `Re(m(t))` and `Im(m(t))` in a 2x1 subplot for the interval `t=-100:0.1:100`.

3. Calculate the energy of the output signal `m(t)` for the time range `t=-100:0.1:100`. Also evaluate the energy of the output signal in frequency domain using Parseval's theorem (use the frequency range `ω=31.4:0.01:31.4`).