```
{'sum|x(n)|^2', '1/N*sum|X(k)|^2'; a, b}'
```

In the MATLAB command window:

```
ans =
    'sum|x(n)|^2'           [690880]
    '1/N*sum|X(k)|^2'       [690880]
```

5.4 Exercises

1. Write a MATLAB program in order to verify the Parseval theorem for:
$$x(n) = \begin{cases} n + 2j, & n = \overline{0, 63}, \\ 0, & \text{otherwise.} \end{cases} \qquad y(n) = \begin{cases} -n + 3j, & n = \overline{0, 63}, \\ 0, & \text{otherwise.} \end{cases}$$

2. Plot the magnitude and the phase of the corresponding DFT for:
$$x(n) = \begin{cases} 1, & n = \overline{0, 5}, \\ 0, & n = \overline{6, 10}. \end{cases}$$

3. Consider the sequence given in Example 2; pad it by 117 zeros. Plot the magnitude and the phase of the DFT for the zero-padded sequence.

4. An amplitude modulated signal, sampled by 1 MHz, whose carrier is of 100 kHz and modulation signal of 10 kHz is considered. For a modulation index of $m = 0.7$ graph the magnitude and the phase spectra.

5. Evaluate the N-point DFTs of:
$$x_1(n) = u(n) - u(n - 20), \qquad n = \overline{0, 30},$$
$$x_2(n) = \begin{cases} n - 1, & n = \overline{0, 5}, \\ (-1)^n, & n = \overline{6, 10}. \end{cases}$$
Graph the sequences and their DFTs (real and imaginary parts, magnitude and phase) for $\omega \in [-\pi, \pi]$ and $N = \{32; 128; 256; 512; 1024\}$.

6. Consider the sequences:
$$x_1(n) = 0.2 \sin\left(2\pi 0.1n + \frac{\pi}{8}\right), \qquad x_2(n) = 2e^{-0.2n}, \quad n = \overline{0, 49}.$$
Plot the considered sequences and their product. Evaluate the magnitude and the phase spectra of the DFTs for $x_1(n)$, $x_2(n)$ and $x_1(n)x_2(n)$. Plot the results.