Problem 3.1
(a) \( a_1 = a_{-1}^* = \frac{1}{2j} \)
\( a_2 = a_{-2}^* = \frac{1}{2} \)
(b) \( a_1 = 1/2, a_{-1} = -1/2 \)
\( a_2 = a_{-2}^* = -\pi/2 \)
(c) \( a_1 = a_{-1}^* = \frac{1}{2j} \)
\( a_2 = a_{-2}^* = \frac{1}{2j} \)
\( a_4 = a_{-4}^* = \frac{1}{2} \)
(d) \( a_0 = 1/2 \)
\( a_1 = a_{-1}^* = 1/2 + j\sqrt{3}/4 \)
(e) \( a_k = 1/5, k = 0 \)
\( a_k = \frac{\sin(k\pi/5)}{k\pi}, k \neq 0 \)

Problem 3.2
(a) \((-2 + j)a_k\)
(b) \(e^{-jk\omega_0}a_k\)
(c) \(jk\omega_0a_k\)
(d) \(a_k + 1, k = 0 \)
\(a_{-k}, k \neq 0 \)
(e) \(e^{-jk\omega_0}a_{-k}\)
(f) \(a_k * a_k\)

Problem 3.3
\[ x(t) = 2\cos(\frac{\pi}{4}t + \frac{\pi}{2}) + 4\cos(\frac{2\pi}{5}t + \frac{\pi}{4}) - 6\cos(\frac{5\pi}{4}t) \]

Problem 3.4
\(a_0 = 1/2\)
\(a_1 = 1/4\)
\(a_{-1} = 1/4\)
\((T = 1)\)

Problem 3.5  Left as an exercise.
Problem 3.6
(a)  \( a_0 = 3 \)
    \( a_1 = a_{-1}^* = 1 \)
    \( (T = 8) \)

(b)  \( a_0 = 1 \)
    \( a_1 = a_{-1}^* = \frac{1}{27} \)
    \( a_5 = a_{-5}^* = 1 \)
    \( (T = 10) \)

(c)  \( a_0 = 1 \)
    \( a_1 = 1 \)
    \( a_2 = a_{-2} = -\frac{1}{2} \)
    \( (T = 2) \)

Problem 3.7
\( A = 1/100 \)
\( T_0 = 10 \)