# MASSACHUSETTS INSTITUTE OF TECHNOLOGY Department of Electrical Engineering and Computer Science

### 6.003: Signals and Systems — Spring 2004

**TUTORIAL 3 SOLUTIONS** 

Tuesday, February 23, 2004

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)  $a_1 = a_{-1}^* = \frac{1}{2}$   $a_2 = a_{-2}^* = \frac{1}{2j}$  $a_4 = a_{-4}^* = \frac{1}{2}$ 

(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)  $jk\omega_0 a_k$
- (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  $x(t) = 2\cos(\frac{\pi}{4}t + \frac{\pi}{2}) + 4\cos(\frac{\pi}{2}t + \frac{\pi}{3}) - 6\cos(\frac{5\pi}{4}t)$ 

## Problem 3.4

Problem 3.5

# Problem 3.6

(a) 
$$a_0 = 3$$
  
 $a_1 = a_{-1}^* = 1$   
 $(T = 8)$   
(b)  $a_0 = 1$   
 $a_1 = a_{-1}^* = \frac{1}{2j}$   
 $a_5 = a_{-5}^* = 1$   
 $(T = 10)$   
(c)  $a_0 = 1$   
 $a_1 = 1$   
 $a_2 = a_{-2} = -\frac{1}{2}$   
 $(T = 2)$ 

# Problem 3.7

A = 1/100 $T_0 = 10$