

1. Math/Algebra: Simplify  $1 + e^{j\pi} =$  \_\_\_\_\_.

Note:

$$e^{j\theta} = \cos \theta + j \sin \theta$$
$$\cos \theta = \frac{e^{j\theta} + e^{-j\theta}}{2}, \quad \sin \theta = \frac{e^{j\theta} - e^{-j\theta}}{2j}$$

2. Sketch the convolution:  $y(t) = \text{tri}(t) * [\delta(t-4) - \delta(t-6)]$ .

3. A discrete-time system is described by  $4y[n] + 3y[n-1] = x[n]$ . Solve for the impulse response  $h[n]$ . Determine if the system described by  $h[n]$  is BIBO stable.

**Do either problem 4 or problem 5 – indicate clearly which problem should be graded:**

4. A continuous-time Fourier series harmonic function is given by:

$$X[k] = \frac{j}{2} \delta[k+3] - \frac{j}{2} \delta[k-3],$$

with fundamental period  $T_F = 0.01$  sec. Write the corresponding time signal in terms of sinusoid(s).

5. Find the harmonic function  $X[k]$  for the signal  $x(t) = 4 \cos(2\pi 250t)$  if  $f_F = 50$ Hz.

**Bonus:** On October 25, 1917, the Bolsheviks seized control over the provisional government at the Winter Palace, located in what Russian city?