1. Determine for each of the following impulse responses whether the corresponding system is (*i*) memoryless, (*ii*) causal, and (*iii*) stable. [12 *points*]
   (a) $h(t) = u(t+1)$
   (b) $h(t) = u(t+2) - u(t-2)$
   (c) $h(t) = \exp(-2t)\ u(t-1)$
   (d) $h(t) = \exp(t)\ \sin(5t)\ u(t)$

2. Consider the LTI system with the transfer function $H(s) = \frac{2s+10}{s^2+2s+10}$. Given the following inputs, find the zero-state response of the system in each case. [10 *points*]
   (a) $x(t) = 4$
   (b) $x(t) = \exp(-2t)$
   (c) $x(t) = 4\sin(3t)$
   (d) $x(t) = 4\exp(\mathbb{i}3t)$, where $\mathbb{i} = \sqrt{-1}$
   (e) How are the responses of Parts (*c*) and (*d*) related?

3. We can use the vector

```
p=[2.3,(1+2i),10];
```

   to represent the quadratic polynomial $p(x) = 2.3x^2 + (1+2\mathbb{i})x + 10$ in MATLAB. We can then evaluate this polynomial at $x = 4.42$ in MATLAB by typing

```
polyval(p,4.42)
```

   at the prompt. Similarly, we could represent the cubic polynomial $q(x) = \pi x^3 + 3x^2 + \mathbb{i}x + 2$ with the vector

```
q=[pi,3,i,2];
```

   in MATLAB. We can evaluate q at $x = 2 + \mathbb{i}$ by typing `polyval(q,2+i)` at the prompt. Verify your answers to problems $2(a) - 2(d)$ using the `polyval` function in MATLAB. Include your MATLAB code as part of your solution printout. [4 *points*]

4. Compute the exponential Fourier series representation for the following signals, and sketch their amplitude and phase spectra. Once you get the exponential Fourier series coefficients, use them to obtain the trigonometric Fourier series in terms of sine and cosine. If either the sine and cosine terms are absent in the trigonometric Fourier series, explain why. [15 *points*]
   (a) Figure P6.1-1(a) on page 669.
   (b) Figure P6.1-1(d) on page 669.
   (c) Figure P6.1-3 on page 670.

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5. For the previous question part $4(a)$, compute the exponential Fourier series coefficients numerically using MATLAB following the computer example C6.4 on page 659. Modify the code for the signal in question $4(a)$ and plot the amplitude and phase spectra for this signal. Compare your results with what you got in problem $4(a)$. Include your code and your plots. [5 *points*]