Some supplementary recitation questions

Chapter 2

1. Determine whether the following signals are periodic, and if so determine the fundamental period.

(a) $x(t) = e^{-(\pi - 2j)t}$ A: NOT

(c) $x(t) = 3e^{j4t} - 2e^{j5t}$ A: Fund period = 2 \pi.

2. Simplify the following expressions and sketch the signal

(c) $x(t) = \int_{-\infty}^{t} u(\tau - 3)\, d\tau - 2r(t-4) + r(t-5)$ A: *x(t) = r(t-3) – 2r(t-4) + r(t-5)*

(d) $x(t) = \int_{-\infty}^{t} \delta(\tau + 2)\, d\tau + \frac{d}{dt}\left[u(t+2)r(t)\right]$ A: $x(t) = u(t+2) + u(t) + r(-2)\delta(t+2)$

(Third term = 0)

3. Sketch the signal $x(t)$ and compute and sketch $\int_{-\infty}^{t} x(\sigma)\, d\sigma$. Check your integration by "graphical differentiation."

(a) $x(t) = u(t) - u(t-1) + 2\delta(t-2) - 3\delta(t-3) + \dot{\delta}(t-4)$

A: $\int_{-\infty}^{t} x(\sigma) d\sigma = r(t) - r(t-1) + 2u(t-2) - 3u(t-3) + \delta(t=4)$

(c) $x(t) = -2u(t+1) + 3u(t) - u(t-2)$ A: $\int_{-\infty}^{t} x(\sigma) d\sigma = 3r(t) - 3r(t-4) - 12u(t-5)$

4. Sketch the signal $x(t)$ and compute and sketch $\dot{x}(t)$. Check your derivative by "graphical integration."

(b) $x(t) = 2r(t+1) - 4r(t) + 2r(t-1)$ A: $\dot{x}(t) = u(t+1) - u(t) + \delta(t) - 3\delta(t-1) + \delta(t-2)$

Chapter 3

1. Determine if the following signals are periodic, and if so compute the fundamental period

(b) $x[n] = e^{j4\pi n} - e^{-j\frac{\pi}{4}n}$ A: PERIODIC. *m=-1, N=8* work

(c) $x[n] = 3e^{j\frac{7}{3}n}$ A: NOT

Chapter 4

3. Determine if each of the following systems is invertible. If not, specify two different input signals that yield the same output. If so, give an expression for the inverse system.

(a) $y(t) = \cos[x(t)]$

(b) $y(t) = x^3(t-4)$

(b) $y[n] = (n-1)x[n]$