University of Notre Dame
Department of Electrical Engineering
EE 30344 – Signals and Systems I
Dr. M. Haenggi

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Practice Exam for Midterm 2

1. A CT LTI system is described by the frequency response

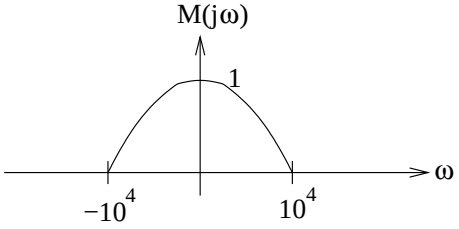
$$H(j\omega) = \frac{e^{-j2\omega}}{2+\omega^2}\,.$$

   Find the output of the system when the input is $\sin(3t + \pi/8)$.

2. A voice signal $m(t)$ with the FT $M(j\omega)$ given below is modulated into an AM radio signal of the form

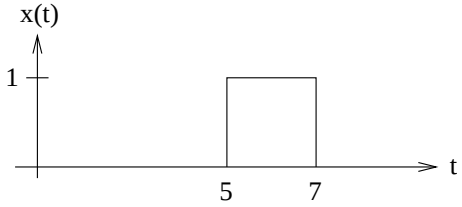
$$z(t) = (1 + m(t))\cos(10^6\pi t)\,.$$

   Sketch the FT of $z(t)$.



3. An LTI DT system has input $x[n]$ and output $y[n]$. We observe that when $x[n] = \delta[n]$, $y[n] = 0.5\delta[n] + 0.5^n\cos(\frac{\pi n}{3})u[n]$. Find a difference equation relating $x[n]$ and $y[n]$.

4. Compute *directly*, showing all your work, the FT of $x(t)$ below and plot its magnitude and phase.



5. We are given a DT FT $Y(e^{j\omega}) = 1 + \cos(\omega) - 2\cos(4\omega)$.
   (a) Find $\sum_{n=-\infty}^{\infty} y[n]$.
   (b) Find $\int_0^{4\pi} Y^2(e^{j\omega})\mathrm{d}\omega$.
   (c) Determine the impulse response $w[n]$ of another LTI system such that $w[n] * y[n]$ is causal with minimum delay.
   (d) Sketch $\mathrm{Od}\{y[n]\}$.

6. Find $h[n]$ for

$$H(e^{j\omega}) = \frac{1 - e^{-j\omega}}{1 - 0.1e^{-j\omega} - 0.3e^{-2j\omega}}\,.$$