1. Text problem 3.4. Carefully set up the Fourier transform integral. Pull out the constants and combine all the exponentials that remain under the integral. This will leave you with an integrand that is an exponential where the exponent is a quadratic polynomial with complex coefficients. You should be able to find this definite integral in the definite integrals section of your math handbook and write down the answer. The answer is a true Gaussian only if $\mu = 0$.

2. Text problem 3.6, parts (a) and (e) only.


5. Text problem 3.15.

6. Text problem 3.16, parts (d) and (e) only.

7. Text problem 3.38, parts (a) and (d) only.

8. Text problem 3.42. **Note:** the graph in Fig. P3.3 should be labeled $X(e^{j\omega})$ instead of $H(e^{j\omega})$. You are given that $X(e^{j\omega})$ “has zero phase.” This means that all the complex numbers $X(e^{j\omega})$ have angles of zero; in other words, it means that $X(e^{j\omega})$ is real.

9. Text problem 4.54. See pages 3-33 through 3-35 of the notes. On page 3-89, it is proved that the signal $e^{j\omega_0 n}$ is an eigenfunction of any discrete-time LTI system. The proof for the signal $z^n$ where $z \in \mathbb{C}$ is very similar.

10. Text problem 4.61. “Zero phase” means that $H(e^{j\omega})$ is real. In other words, the problem asks you to find conditions on the constants to guarantee that the imaginary part of $H(e^{j\omega})$ is zero. You should assume that the constants $a_1 - a_6$ are real-valued.

11. Text problem 4.62. You should assume that the constants $a_1 - a_8$ are real-valued. For $H(e^{j\omega})$ to have **true** linear phase, you would have to find values of the constants $a_1 - a_8$ so that $H(e^{j\omega}) = A(\omega) e^{j\phi(\omega)}$ where $\phi(\omega)$ is real and linear in $\omega$, $A(\omega)$ is real, and $A(\omega) \geq 0$ (positive semidefinite). That is not possible in this problem. Instead, you should seek values of the constants $a_1 - a_8$ that guarantee a **generalized linear phase**. This means that $H(e^{j\omega}) = A(\omega) e^{j\phi(\omega)}$ where $\phi(\omega)$ is real and linear in $\omega$ and $A(\omega)$ is real, but not necessarily positive semidefinite.

12. Fig. 2.12(a) on p. 54 of the text shows the block diagram of an ideal up-sampler. The input-output relation is given in eq. (2.23), also on p. 54. Use the DTFT to find the frequency domain relationship between the input $X(e^{j\omega})$ and the output $X_u(e^{j\omega})$.

DUE: 9/27/2017 (in class)