1. (30 points) O & W problem 7.21
2. (20 points) O & W problem 7.22
3. (40 points) Suppose that $x(t) = \text{sinc}(10\pi t) + \cos(17\pi t)$.
   (a) Plot $|X(j\omega)|$.
   (b) What is the Nyquist frequency $\omega_M$ of $x(t)$?
   (c) What is the Nyquist rate of $x(t)$? Let $T_n = 2\pi/\omega_s$ where $\omega_s$ is the Nyquist rate.
   (d) Suppose that $T = T_n/2$.
      i. Find an equation for $x[n] = x(nT)$, the output of an ideal continuous-to-discrete converter.
      ii. Find an equation for $x_p(t)$.
      iii. Find an equation for $X_p(j\omega)$.
      iv. Find an equation for $X_d(e^{j\omega})$.
      v. Plot $|X_p(j\omega)|$ (show three periods).
      vi. Plot $|X_d(e^{j\omega})|$ (show three periods).
      vii. Suppose that $x[n]$ is input into an ideal discrete-to-continuous converter. Find an equation for the output $x_r(t)$.
   (e) Suppose that $T = 2T_n$.
      i. Find an equation for $x[n] = x(nT)$, the output of an ideal continuous-to-discrete converter.
      ii. Find an equation for $x_p(t)$.
      iii. Find an equation for $X_p(j\omega)$.
      iv. Find an equation for $X_d(e^{j\omega})$.
      v. Plot $|X_p(j\omega)|$ (show three periods).
      vi. Plot $|X_d(e^{j\omega})|$ (show three periods).
      vii. Suppose that $x[n]$ is input into an ideal discrete-to-continuous converter. Find an equation for the output $x_r(t)$. Explain how this differs from the case where $T = T_n/2$ and why.
   (f) Compare your results in the previous two parts.
4. (10 points) Watch the video here on the wagon wheel effect, and summarize the results. https://youtu.be/VNftf5qLpiA

Extra Problems (NOT GRADED) Note from Prof. Heath: You will be given solutions to these problems. You should known how to work them for exams.

5. O & W 7.25 (reconstruction formula)