1. A photoresist gives a final resist thickness of 320 nm when spun at 2800 rpm.
   a) What spin speed should be used if a 290-nm-thick coating of this same resist is desired?
   b) If the maximum practical spin speed for 200-mm wafers is 4000 rpm, at what thickness would a lower viscosity formulation of the resist be required?

2. Complimentary mask features (for example, an isolated line and an isolated space of the same width) are defined by

   \[ t_m^c(x,y) = 1 - t_m(x,y) \]

Prove that the diffraction patterns of complimentary mask features are given by

   \[ T_m^c(f_x, f_y) = \delta(f_x, f_y) - T_m(f_x, f_y) \]

Use this expression to derive the diffraction pattern of an isolated line.

3. Show that the Fourier transform is a linear operation, that is, show that for two functions \( f(x,y) \) and \( g(x,y) \), and two constants \( a \) and \( b \),

   \[ \mathcal{F}\{af(x,y) + bg(x,y)\} = aF(f_x, f_y) + bG(f_x, f_y) \]

4. Prove the shift theorem of the Fourier transform:

   If \( \mathcal{F}\{g(x,y)\} = G(f_x, f_y) \), \( \mathcal{F}\{g(x-a, y-b)\} = G(f_x, f_y)e^{-i2\pi(f_xa + f_yb)} \)

5. Prove the similarity theorem of the Fourier transform:

   If \( \mathcal{F}\{g(x,y)\} = G(f_x, f_y) \), \( \mathcal{F}\{g(ax, by)\} = \frac{1}{|ab|} G\left( \frac{f_x}{a}, \frac{f_y}{b} \right) \)