Homework #2:

3.2. Consider an LSI medical imaging system with PSF given by
\[ h(x, y) = \frac{1}{2\pi} e^{-\left(x^2 + y^2\right)/2} \]

(a) Calculate the MTF

(b) Plot the MTF

(c) If a sinusoidal object \( f(x, y) = 2 + \sin(\pi x) \) is imaged through the system what is the percentage change in modulation caused by this system?

3.6 A new imaging system with which you are experimenting has anisotropic properties. You measure the impulse response function as
\[ h(x, y) = e^{-\pi(x^2 + y^2/4)} \]
What is the FWHM of the system as a function of polar angle \( \theta \)

3.11 A bar phantom is imaged by an LSI system which is modeled as an ideal moving average system. The PSF of the system is
\[ h(x, y) = \text{rect}\left(\frac{x}{\Delta}, \frac{y}{\Delta}\right) \]

(a) If bar separation of the bar phantom is \( \Delta \) what is the output of the imaging system?

(b) If bar separation of the bar phantom is \( \Delta/2 \) what is the output of the imaging system?

(c) Derive a relationship between the contrast of the output image and the bar separation and draw a conclusion about the resolution of the input image.