for a function \( f(x, y) \),
\[
\nabla^2 f(x, y) = -(u^2 + v^2)F(u, v).
\]
Thus, we have reduced the problem to finding the Fourier transform of \( e^{-r^2/2\sigma^2} \), which is in the form of a Gaussian function. From Table 4.1, we note from the Gaussian transform pair that the Fourier transform of a function of the form \( e^{-(x^2+y^2)/2\sigma^2} \) is
\[
\mathfrak{F} \left( e^{-(x^2+y^2)/2\sigma^2} \right) = \sqrt{2\pi}\sigma e^{-2\pi^2\sigma^2(x^2+y^2)}.
\]
Therefore, the Fourier transform of the given degradation function is
\[
H(u, v) = \mathfrak{F} \left( \frac{r^2}{\sigma^4} e^{-r^2/2\sigma^2} \right) = \mathfrak{F} \left( \nabla^2 h_0(r) \right)
= -(u^2 + v^2)F(u, v)
= -\sqrt{2\pi}\sigma \frac{r^2}{\sigma^4} \mathfrak{F} \left( \frac{r^2}{\sigma^4} e^{-r^2/2\sigma^2} \right)
= \sqrt{2\pi\sigma} \frac{r^2}{\sigma^4} \frac{1}{2\pi\sigma^2(u^2 + v^2)^2} e^{-4\pi^2\sigma^2(x^2+y^2)}
= \frac{1}{2\pi\sigma^2(u^2 + v^2)^2} e^{-4\pi^2\sigma^2(x^2+y^2)} + K.
\]

**Problem 5.22**

This is a simple plugin problem. Its purpose is to gain familiarity with the various terms of the Wiener filter. From Eq. (5.8-3),
\[
H_W(u, v) = \frac{1}{H(u, v) |H(u, v)|^2 + K}
\]
where
\[
|H(u, v)|^2 = H^*(u, v)H(u, v) = 2\pi\sigma^2(u^2 + v^2)^2 e^{-4\pi^2\sigma^2(x^2+y^2)}.
\]
Then,
\[
H_W(u, v) = \left[ \frac{\sqrt{2\pi\sigma}(u^2 + v^2)e^{-2\pi^2\sigma^2(x^2+y^2)}}{2\pi\sigma^2(u^2 + v^2)^2 e^{-4\pi^2\sigma^2(x^2+y^2)} + K} \right].
\]

**Problem 5.23**

This also is a simple plugin problem, whose purpose is the same as the previous problem. From Eq. (5.9-4)
\[
H_C(u, v) = \frac{H^*(u, v)}{|H(u, v)|^2 + \gamma |P(u, v)|^2}
= \frac{H^*(u, v)}{2\pi\sigma(u^2 + v^2)e^{-2\pi^2\sigma^2(x^2+y^2)} + \gamma |P(u, v)|^2}
\]
where \( P(u, v) \) is the Fourier transform of the Laplacian operator [Eq. (5.9-5)]. This is as far as we can reasonably carry this problem. It is worthwhile pointing out to students...