T= consolve 2d (g, h make = 'valid'

> 7.08 × 106 MSE = 1 5 (G(x,y) - G(x, x) アニ 0

 $P_{0}4$ $G(x,y) = \frac{1}{2\pi G^{2}} - \frac{(x^{2}+y^{2})/2\pi^{2}}{2\pi G^{2}}$ a) F(x,y) = F(x) F(y) for a reparable

Silter 2 D Gowshim.

G(N,y) = 1 $e^{\frac{y^2}{26^2}}$ $G(X,y) = \frac{1}{2\pi 6^2}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $e^{\frac{y^2}{26^2}}$ $G(x,y) = G(x) \cdot G_{y}(y)$ Alastuga is noiseuro (15

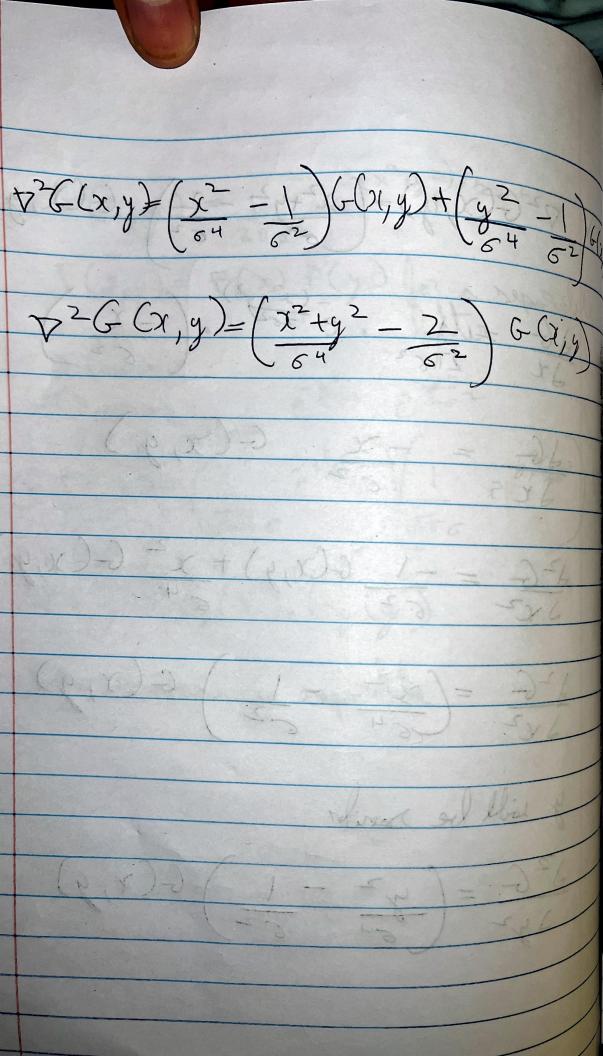
6)
$$\nabla^{2}G(x,y) = \left(\frac{x^{2}+y^{2}}{6^{2}} - \frac{2}{6^{2}}\right)G(x,y)$$

$$\frac{dG}{dx} = \frac{1}{2\pi\sigma^{2}} \cdot \left(-\frac{x}{2}\right)$$

$$\frac{dG}{dx} = -\frac{x}{6^{2}} \cdot G(x,y) + \frac{x^{2}}{6^{2}} \cdot G(x,y)$$

$$\frac{d^{2}G}{dx} = -\frac{1}{6^{2}} \cdot G(x,y) + \frac{x^{2}}{6^{2}} \cdot G(x,y)$$

$$\frac{d^{2}G}{dx} = \left(\frac{x^{2}}{6^{2}} - \frac{1}{6^{2}}\right)G(x,y)$$



```
[1] import numpy as np
    import math
    # Template approximation (scaled)
    template = np.array([
        [1, 4, 7, 4, 1],
        [4, 16, 26, 16, 4],
        [7, 26, 41, 26, 7],
        [4, 16, 26, 16, 4],
        [1, 4, 7, 4, 1]
    1) / 273
    # Define the Gaussian function
    def gaussian_2d(x, y, sigma=1):
        return (1 / (2 * np.pi * sigma**2)) * np.exp(-(x**2 + y**2) / (2 * sigma**2))
    # true Gaussian values -2 to 2
    x vals = np.arange(-2, 3)
    y_{vals} = np.arange(-2, 3)
    true_gaussian = np.array([[gaussian_2d(x, y) for y in y_vals] for x in x_vals])
    mse = np.mean((true_gaussian - template) ** 2)
    mse
```