```
import cv2
import numpy as np
import matplotlib.pyplot as plt
from google.colab import files

uploaded = files.upload()
filename = next(iter(uploaded))
image = cv2.imread(filename, cv2.IMREAD_GRAYSCALE)

Gx = np.array([
    [-1,  0,  1],
    [-2,  0,  2],
    [-1,  0,  1]
], dtype=np.float32)

Gy = np.array([
    [-1, -2, -1],
    [ 0,  0,  0],
    [ 1,  2,  1]
], dtype=np.float32)

grad_x = cv2.filter2D(image, -1, Gx)
grad_y = cv2.filter2D(image, -1, Gy)

gradient_magnitude = cv2.addWeighted(cv2.convertScaleAbs(grad_x), 0.5,
                                     cv2.convertScaleAbs(grad_y), 0.5, 0)

sharpened = cv2.add(image, gradient_magnitude)

plt.figure(figsize=(15, 5))

plt.subplot(1, 3, 1)
plt.imshow(image, cmap='gray')
plt.title("Original Image")
plt.axis('off')

plt.subplot(1, 3, 2)
plt.imshow(gradient_magnitude, cmap='gray')
plt.title("Gradient Magnitude")
plt.axis('off')

plt.subplot(1, 3, 3)
plt.imshow(sharpened, cmap='gray')
plt.title("Sharpened Image")
plt.axis('off')

plt.tight_layout()
plt.show()
```

Choose Files i17.PNG

- **i17.PNG**(image/png) - 392400 bytes, last modified: 5/7/2025 - 100% done

```
Saving i17.PNG to i17.PNG
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