Lab 7: Total Variation Denoising

Primary Goal: Learn how to extend the Total Variation denoising algorithm to color images.
Secondary Goal: Practice formatting equations and data tables.

Your goal is to run the Total Variation (TV) denoising algorithm on a color image. First create a noisy color image by adding Gaussian noise with mean 0 and variance 0.01 to the "peppers" image.

```
A_ideal = imread('peppers.png');
A_noisy = imnoise(A_ideal, 'gaussian', 0, 0.01);
```

Next run your TV denoising code from Activity 7 on each channel of the RGB image, similar to how you ran anisotropic diffusion on a color image in Lab 6. Try 3 different values of the fidelity weight: $\lambda = 1, 0.1, 0.01$. Display the original noisy image and the 3 denoised images in an appropriate subplot.

Compare your 3 denoised images to the ideal noise-free image and compute the SNR and RMSE. You may use the SNR and RMSE functions from Lab 4. Display your statistics in a data table. Make sure you label each image appropriately in the table.

In your text, describe the TV denoising algorithm. Type equations for the TV energy and the PDE you are evolving. Explain how you extended the TV denoising model to color images.

What to Include in Your Report

1. *[10 points]* Describe the TV denoising algorithm and how you extended it to color images. Include your code and equations for the energy and the associated PDE.
2. *[5 points]* Create a figure that displays the noisy "peppers" image and the 3 denoised results in an appropriate subplot. Be sure to include a caption on your figure and a title on each image.
3. *[5 points]* Create a data table that displays the SNR and RMSE for the 3 denoised images. Be sure to include a caption on the data table.