Jupyter Notebook Execution Report

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Project Title: Lab1

Project SubTitle: Labwork

Date: January 05, 2026

Cell 1: ■ Markdown

Lab 1

Cell 2: ■ Markdown

Experiment 1

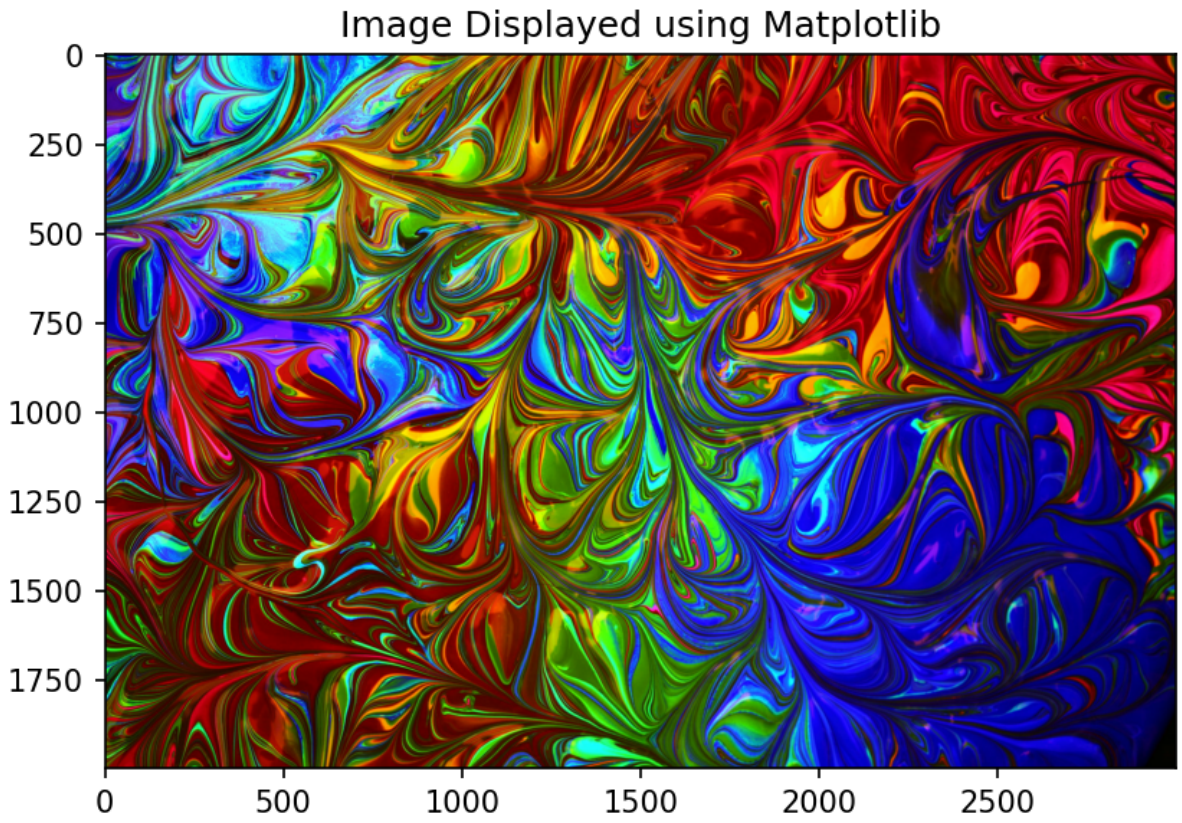
Cell 3: ■ Code

```
import cv2 as cv
import numpy as np
import matplotlib.pyplot as plt
```

```
img = cv.imread("art.jpg")
plt.imshow(img)
plt.title("Image Displayed using Matplotlib")
plt.show()
```

Output:

```
[STDERR]
&lt;string&gt;:1: UserWarning: FigureCanvasAgg is non-interactive, and thus cannot be shown
```



Cell 4: ■ Markdown

Experiment 2

Cell 5: ■ Code

```
print(img.shape)
print(img.dtype)
```

Output:

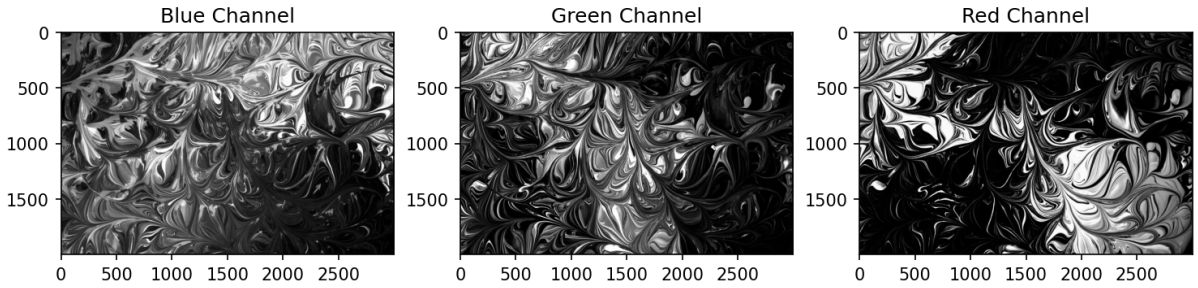
```
(2000, 3000, 3)
uint8
```

Cell 6: ■ Markdown

Experiment 3

Cell 7: ■ Code

```
b, g, r = cv.split(img)
plt.figure(figsize=(12,4))
plt.subplot(1,3,1)
plt.imshow(b, cmap='gray')
plt.title("Blue Channel")
plt.subplot(1,3,2)
plt.imshow(g, cmap='gray')
plt.title("Green Channel")
plt.subplot(1,3,3)
plt.imshow(r, cmap='gray')
plt.title("Red Channel")
plt.show()
```

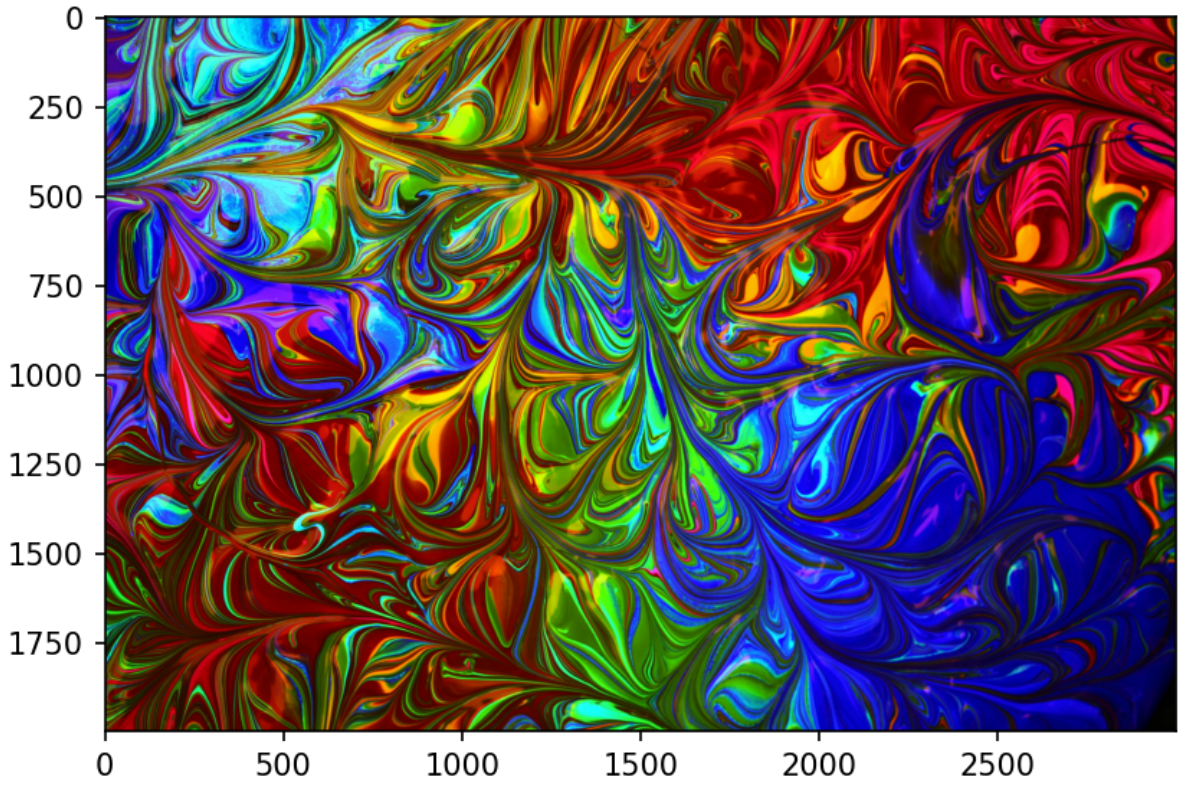


Cell 8: ■ Code

```
plt.imshow(img)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A7DEF4D90&gt;
```



Cell 9: ■ Markdown

Experiment 4

Cell 10: ■ Code

```
x, y = 100, 50
pixel = img[y, x]
print(pixel) # BGR
```

Output:

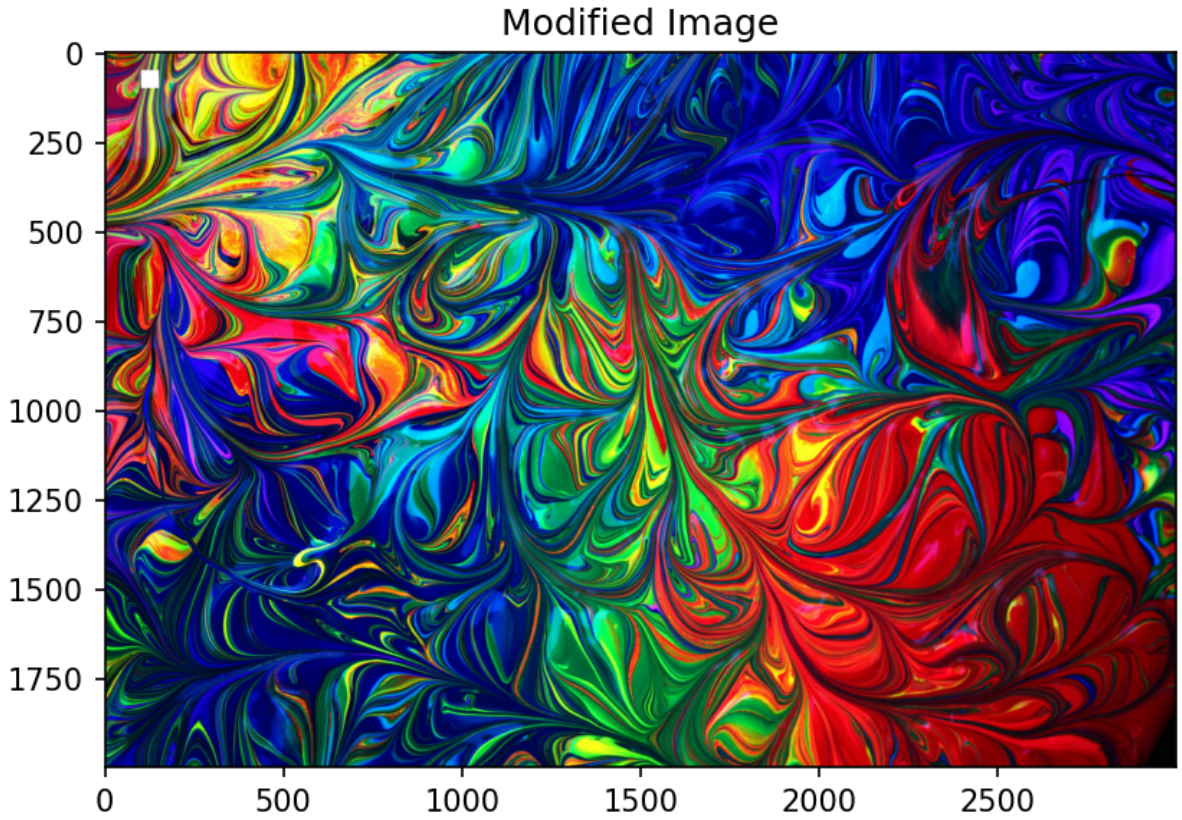
```
[ 88 111 143]
```

Cell 11: ■ Markdown

Experiment 5

Cell 12: ■ Code

```
imgm = img.copy()
imgm[50:100, 100:150] = [255, 255, 255]
plt.imshow(cv.cvtColor(imgm, cv.COLOR_BGR2RGB))
plt.title("Modified Image")
plt.show()
```

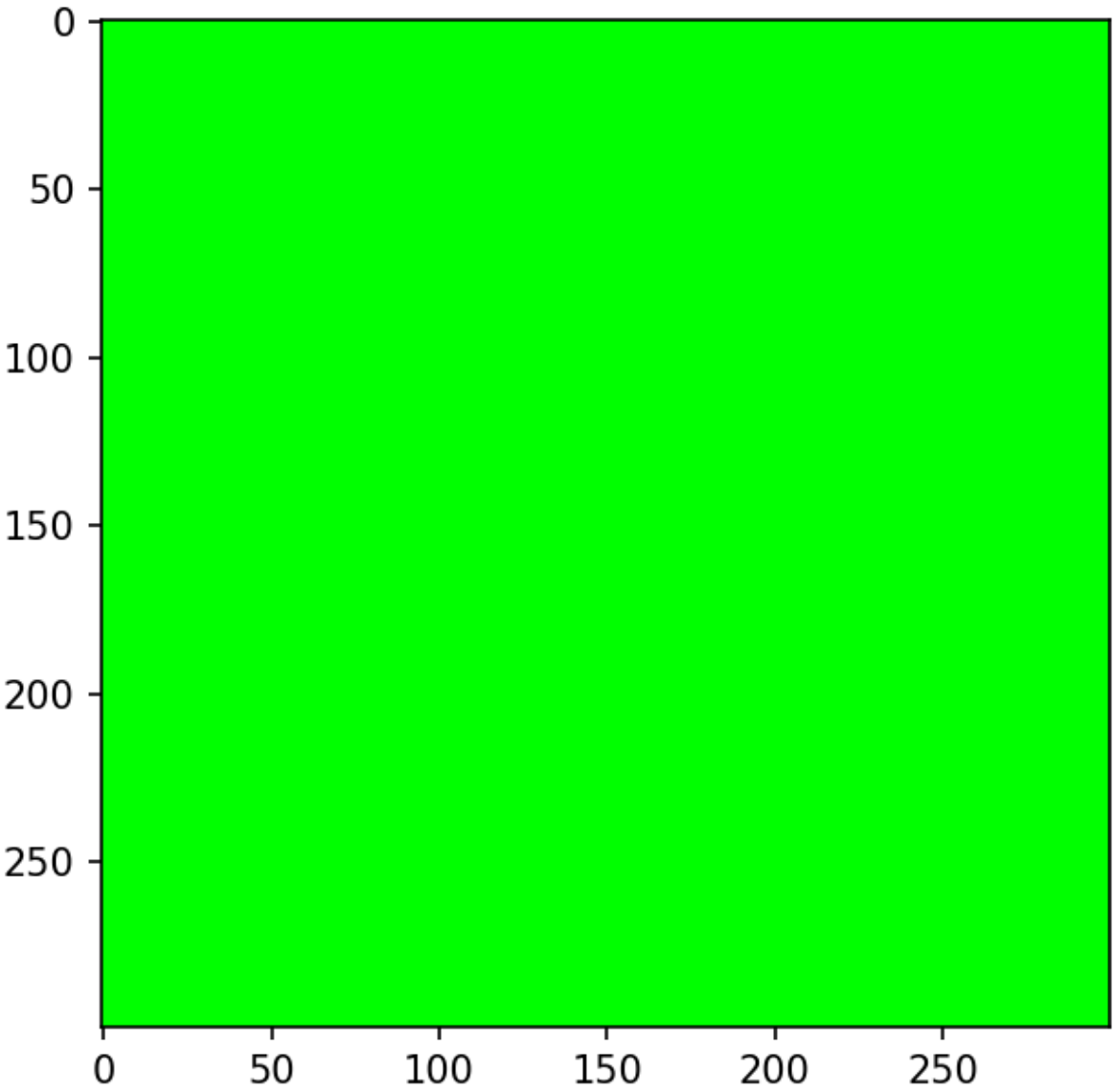


Cell 13: ■ Markdown

Experiment 6

Cell 14: ■ Code

```
g = np.zeros((300, 300, 3), dtype=np.uint8)
g[:] = [0, 255, 0]
plt.imshow(cv.cvtColor(g, cv.COLOR_BGR2RGB))
plt.show()
```



Cell 15: ■ Markdown

Experiment 7

Cell 16: ■ Code

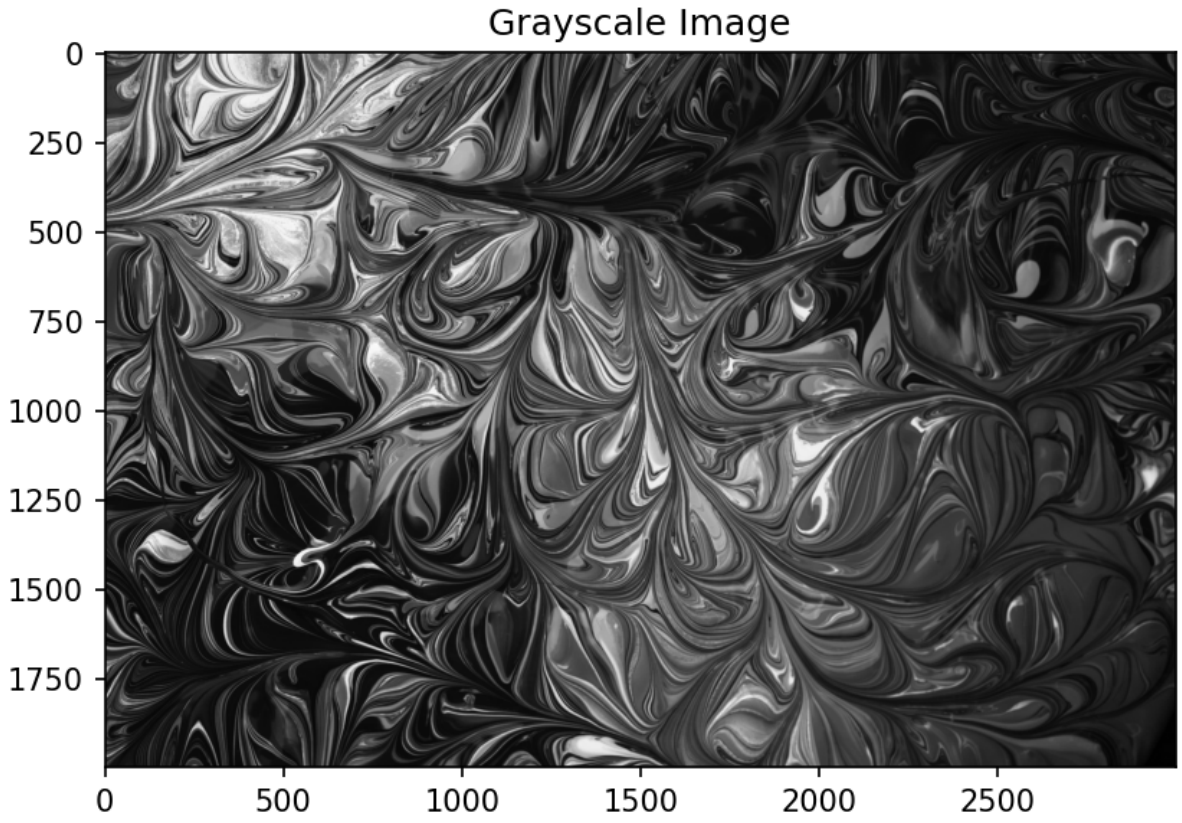
```
gray = cv.cvtColor(img, cv.COLOR_BGR2GRAY)
plt.imshow(gray, cmap='gray')
plt.title("Grayscale Image")
plt.show()
print("Grayscale image shape:", gray.shape)
```

Output:

```
Grayscale image shape: (2000, 3000)
```

```
[STDERR]
```

```
&lt;string&gt;:4: UserWarning: FigureCanvasAgg is non-interactive, and thus cannot be shown
```



Cell 17: ■ Markdown

Lab Assignment 1

Cell 18: ■ Markdown

Question 1

Cell 19: ■ Code

```
dim = img.shape
centerpixel = img[dim[0]//2, dim[1]//2]
```

```
centerpixel
```

Output:

```
array([50, 77, 67], dtype=uint8)
```

Cell 20: ■ Markdown

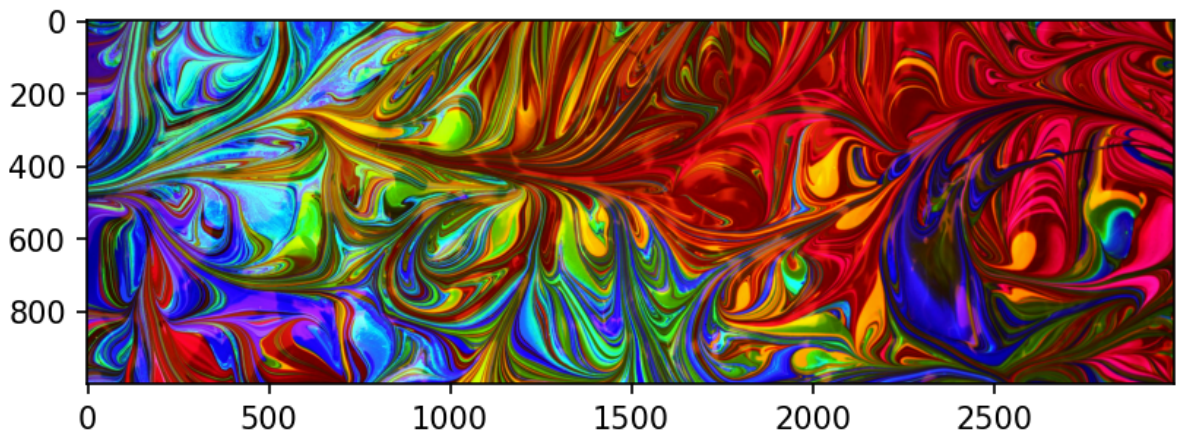
Question 2

Cell 21: ■ Code

```
halfimg = img[:dim[0]//2, :, :]
plt.imshow(halfimg)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A047AFAD0&gt;
```

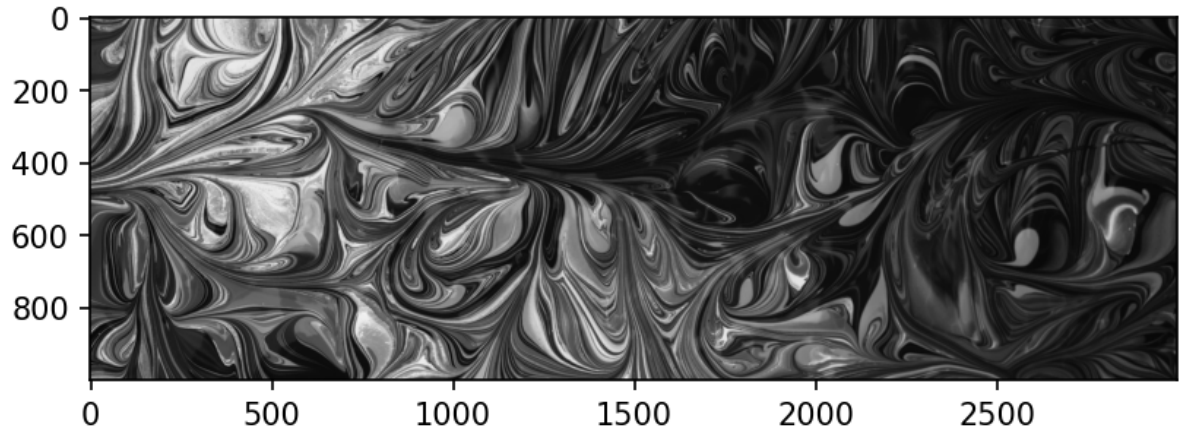


Cell 22: ■ Code

```
grayhalf = cv.cvtColor(halfimg, cv.COLOR_BGR2GRAY)
graybgr = cv.cvtColor(grayhalf, cv.COLOR_GRAY2BGR)
plt.imshow(graybgr)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A0108A650&gt;
```

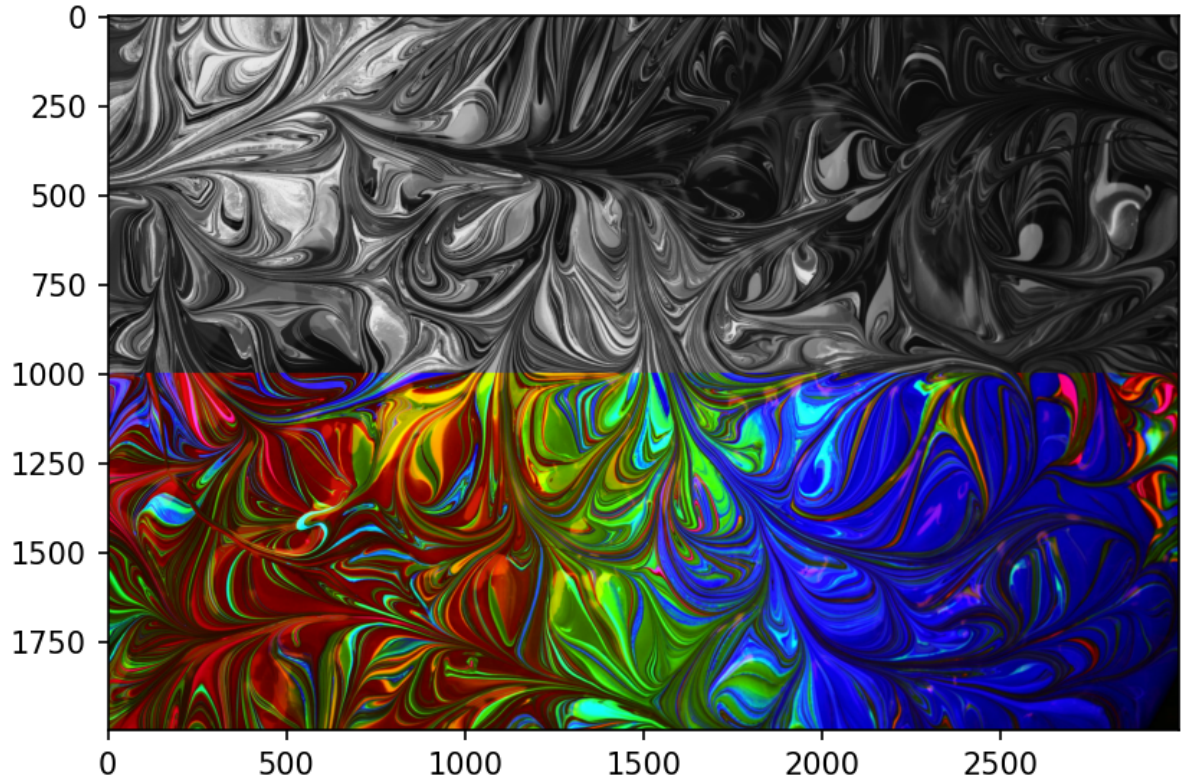


Cell 23: ■ Code

```
nimg = img.copy()
nimg[:dim[0]//2, :] = graybgr
plt.imshow(nimg)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A0481DD90&gt;
```



Cell 24: ■ Markdown

Question 3

Cell 25: ■ Code

```
plt.subplot(1, 2, 1)
plt.imshow(img)
```

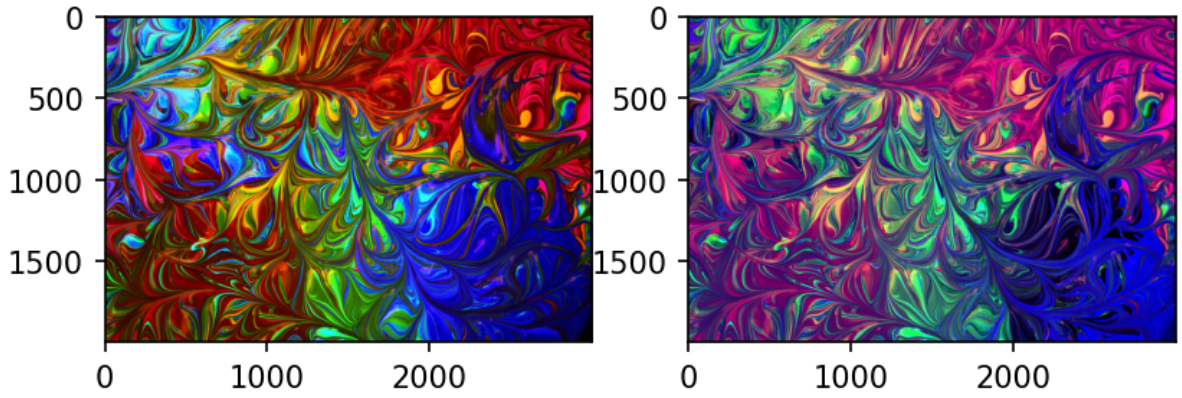
```
nimg = img.copy()
brightness = 100
for x in range(dim[0]):
for y in range(dim[1]):
#increased blue brightness only
nimg[x, y][2] += brightness
```

```
plt.subplot(1, 2, 2)
plt.imshow(nimg)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A047CC8D0&gt;
```

```
[STDERR]
&lt;string&gt;:9: RuntimeWarning: overflow encountered in scalar add
```



Cell 26: ■ Markdown

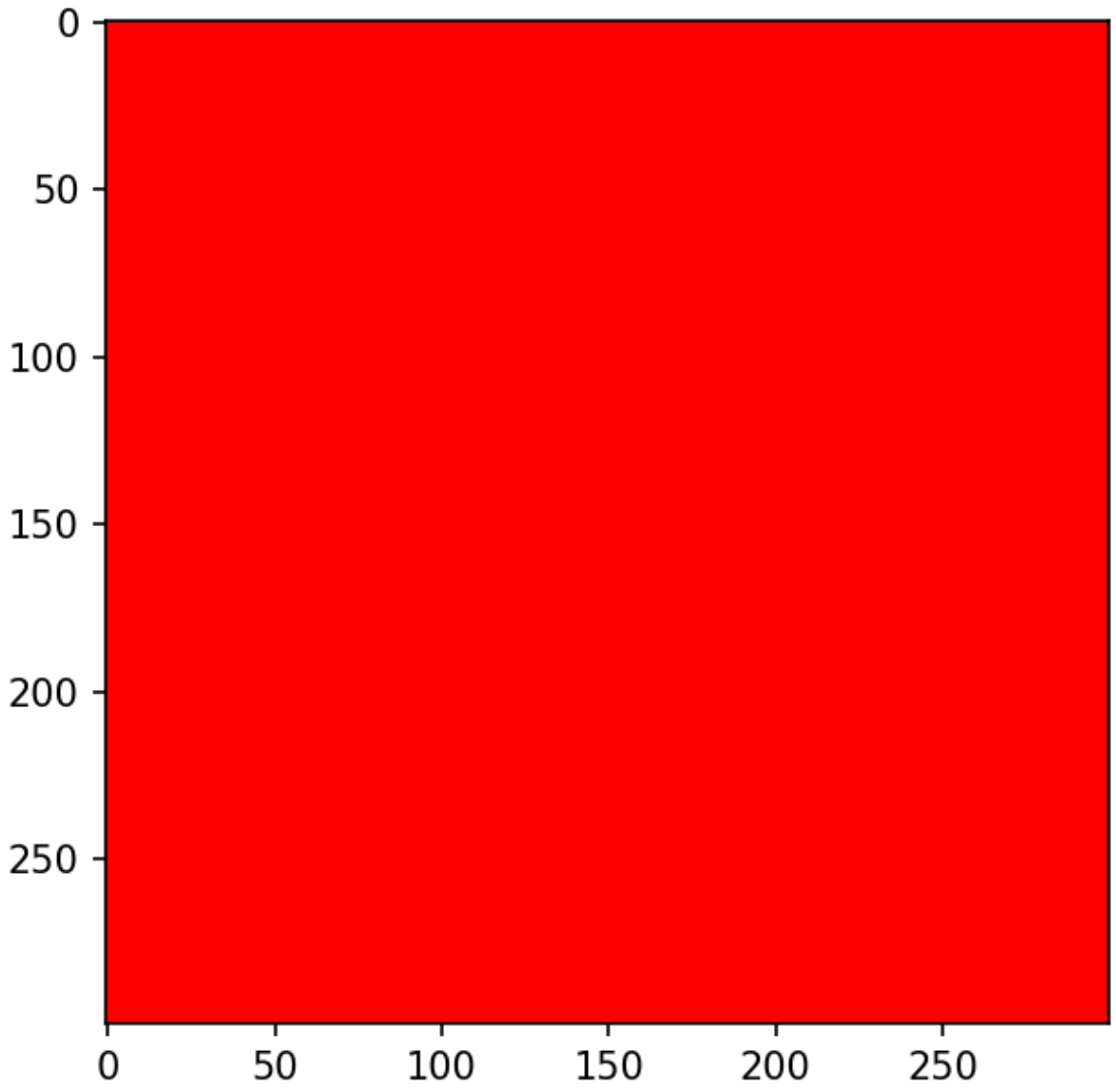
Question 4

Cell 27: ■ Code

```
redsq = np.zeros((300, 300, 3), dtype=np.uint8)
redsq[:] = [255, 0, 0]
plt.imshow(redsq)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A05145F50&gt;
```

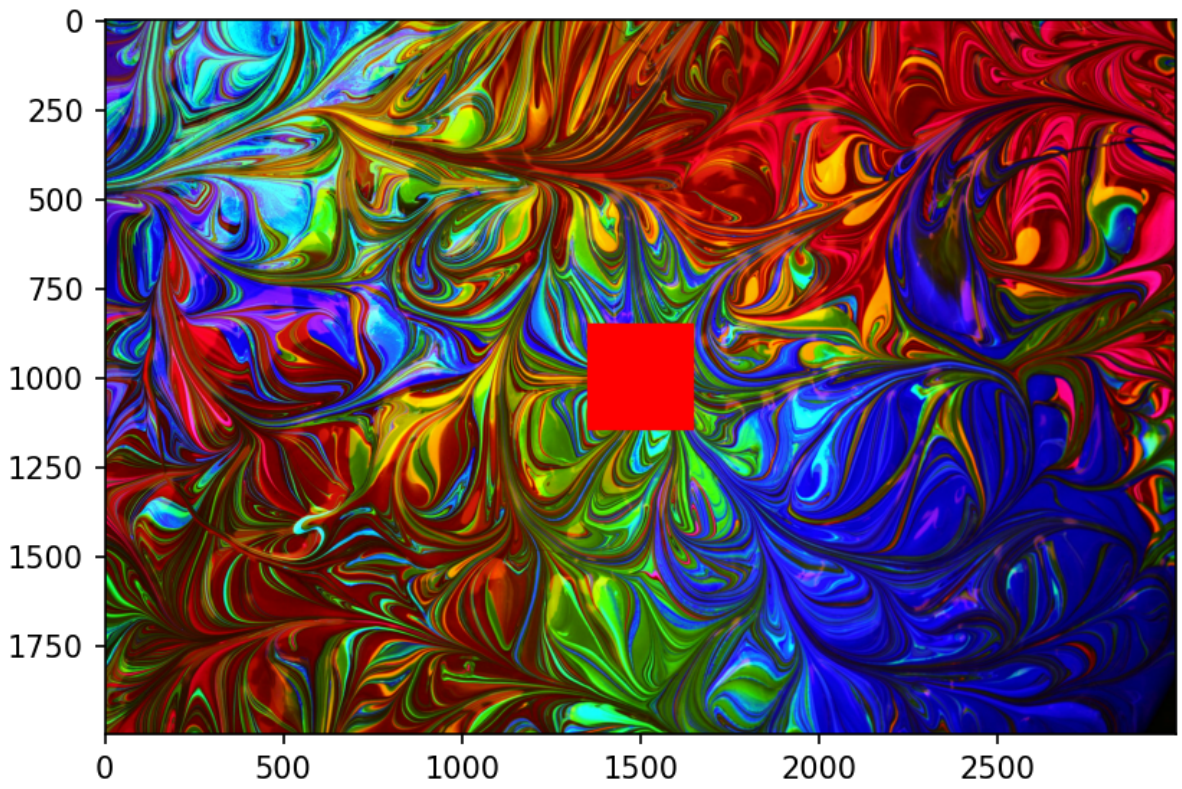


Cell 28: ■ Code

```
nimg = img.copy()
nimg[dim[0]//2 - 150:dim[0]//2 + 150, dim[1]//2 - 150:dim[1]//2 + 150] = redsq
plt.imshow(nimg)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A050A4C90&gt;
```



Cell 29: ■ Markdown

Question 5

Cell 30: ■ Code

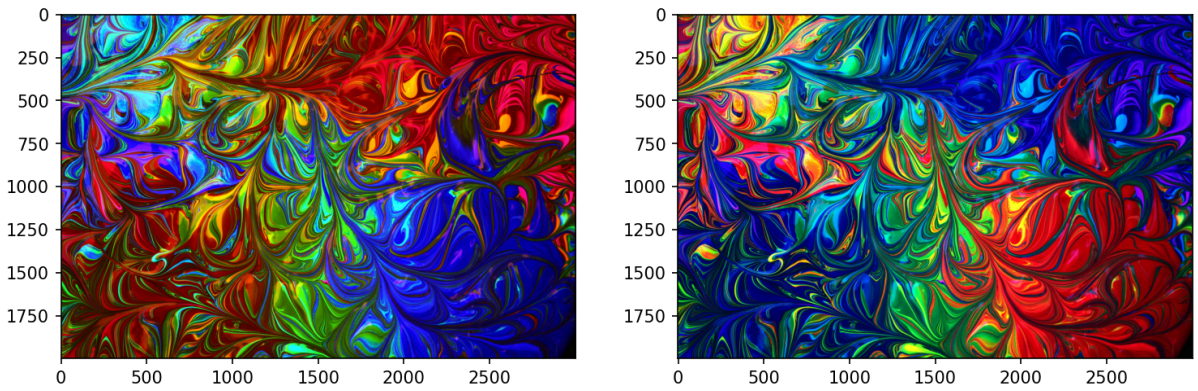
```
nimg = img.copy()
nimg = nimg[:, :, ::-1]
```

```
plt.figure(figsize=(12, 6))
plt.subplot(1, 2, 1)
plt.imshow(img)
plt.subplot(1, 2, 2)
```

```
plt.imshow(nimg)
```

Output:

```
&lt;matplotlib.image.AxesImage object at 0x0000029A050C9790&gt;
```



Cell 31: ■ Code