In [1]:
```
import numpy as np
```

In [3]:
```
ones_arr = np.ones((4,4))
```

In [21]:
```
ones_arr
print(type(ones_arr))
print(type(ones_arr[0,0]))
```

```
<class 'numpy.ndarray'>
<class 'numpy.float64'>
```

In [25]:
```
ones_arr2 = np.ones((3,3),dtype = int)
print(ones_arr2)
print(type(ones_arr2))
print(type(ones_arr2[0,0]))
```

```
[[1 1 1]
 [1 1 1]
 [1 1 1]]
<class 'numpy.ndarray'>
<class 'numpy.int32'>
```

In [27]:
```
ones_arr = np.ones((5,5),dtype=int)
```

In [29]:
```
ones_arr
```

Out[29]:
```
array([[1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1],
       [1, 1, 1, 1, 1]])
```

In [31]:
```
zeros_arr = np.zeros((3,3), dtype = int)
```

In [33]:
```
zeros_arr
```

Out[33]:
```
array([[0, 0, 0],
       [0, 0, 0],
       [0, 0, 0]])
```

In [35]:
```
ones_arr * 255
```

Out[35]:
```
array([[255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255],
       [255, 255, 255, 255, 255]])
```

In [45]:
```
# importing matplotlib
import matplotlib.pyplot as plt
%matplotlib inline # to keep the output and graph in same window
import warnings
warnings.filterwarnings('ignore')
```

```
UsageError: unrecognized arguments: # to keep the output and graph in same window
```

In [47]:
```
# importing image library PIL (known as Python image library) => pillow
from PIL import Image # python image library

# to access the image from local disk use .open() method
```

In [57]:
```
horse_img = Image.open(r"F:\horse.jpg")
horse_img
```

Out[57]:

In [59]:
```
print(type(horse_img))
```

```
<class 'PIL.JpegImagePlugin.JpegImageFile'>
```

In [61]:
```
horse_arr = np.asarray(horse_img)
horse_arr
# asarray
```

Out[61]:
```
array([[[ 25,  21,  10],
        [ 25,  21,  10],
        [ 25,  21,  10],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       [[ 24,  20,   9],
        [ 25,  21,  10],
        [ 25,  21,  10],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       [[ 24,  20,   9],
        [ 24,  20,   9],
        [ 24,  20,   9],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       ...,

       [[ 99,  69,  31],
        [ 91,  61,  23],
        [ 94,  66,  29],
        ...,
        [112,  94,  72],
        [109,  91,  69],
        [107,  89,  67]],

       [[120,  94,  61],
        [114,  89,  58],
        [107,  82,  52],
        ...,
        [ 92,  74,  54],
        [ 95,  77,  57],
        [ 98,  80,  60]],
```

```
[[ 92,  69,  38],
 [ 97,  73,  45],
 [ 85,  63,  39],
 ...,
 [ 68,  50,  30],
 [ 79,  61,  41],
 [ 88,  70,  50]]], dtype=uint8)
```

In [63]:
```
print(type(horse_arr))
```

```
<class 'numpy.ndarray'>
```

In [65]:
```
horse_arr.shape
```

Out[65]:
```
(408, 612, 3)
```

In [67]:
```
plt.imshow(horse_arr)
```

Out[67]:
```
<matplotlib.image.AxesImage at 0x20ef7df8b60>
```

In [69]:
```
horse_red = horse_arr.copy() # creating a copy of a image array to another array
```

In [71]:
```
    horse_red
```

Out[71]:
```
array([[[ 25,  21,  10],
        [ 25,  21,  10],
        [ 25,  21,  10],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       [[ 24,  20,   9],
        [ 25,  21,  10],
        [ 25,  21,  10],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       [[ 24,  20,   9],
        [ 24,  20,   9],
        [ 24,  20,   9],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       ...,

       [[ 99,  69,  31],
        [ 91,  61,  23],
        [ 94,  66,  29],
        ...,
        [112,  94,  72],
        [109,  91,  69],
        [107,  89,  67]],

       [[120,  94,  61],
        [114,  89,  58],
        [107,  82,  52],
        ...,
        [ 92,  74,  54],
        [ 95,  77,  57],
        [ 98,  80,  60]],
```

```
[[ 92,  69,  38],
 [ 97,  73,  45],
 [ 85,  63,  39],
 ...,
 [ 68,  50,  30],
 [ 79,  61,  41],
 [ 88,  70,  50]]], dtype=uint8)
```

In [73]:
```
horse_arr == horse_red
```

Out[73]:
```
array([[[ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True],
        ...,
        [ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True]],

       [[ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True],
        ...,
        [ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True]],

       [[ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True],
        ...,
        [ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True]],

       ...,

       [[ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True],
        ...,
        [ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True]],

       [[ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True],
        ...,
        [ True,  True,  True],
        [ True,  True,  True],
        [ True,  True,  True]],
```

```
        [[ True,  True,  True],
         [ True,  True,  True],
         [ True,  True,  True],
         ...,
         [ True,  True,  True],
         [ True,  True,  True],
         [ True,  True,  True]]])
```

In [75]:
```
horse_img == horse_arr
```

Out[75]:
```
False
```

In [77]:
```
plt.imshow(horse_red)
```

Out[77]:
```
<matplotlib.image.AxesImage at 0x20ef9599220>
```

In [79]:
```
horse_red.shape
```

Out[79]: (408, 612, 3)

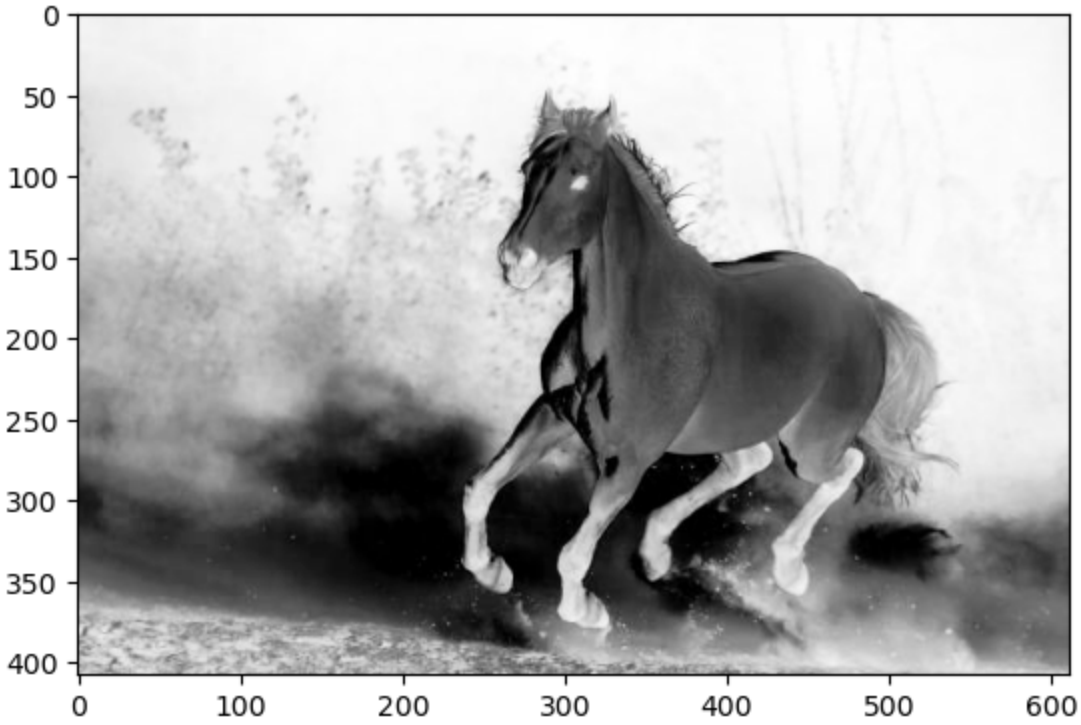
In [81]:
```
# R G B
```

In [83]:
```
plt.imshow(horse_red[:,:,0])
```

Out[83]: <matplotlib.image.AxesImage at 0x20ef7dfaf00>

In [85]:
```
# cmap => color map
plt.imshow(horse_red[:,:,0], cmap = 'Greys')
```

Out[85]: <matplotlib.image.AxesImage at 0x20ef9603c80>



In [91]:
```
plt.imshow(horse_red[:,:,1], cmap = 'grey')
```

Out[91]:
```
<matplotlib.image.AxesImage at 0x20ef8e6e7e0>
```

In [95]:
```
plt.imshow(horse_red[:,:,2], cmap = 'grey')
```

Out[95]:
```
<matplotlib.image.AxesImage at 0x20ef8e56030>
```

In [97]:
```
horse_red[:,:,0]
```

Out[97]:
```
array([[ 25,  25,  25, ...,  24,  24,  24],
       [ 24,  25,  25, ...,  24,  24,  24],
       [ 24,  24,  24, ...,  24,  24,  24],
       ...,
       [ 99,  91,  94, ..., 112, 109, 107],
       [120, 114, 107, ...,  92,  95,  98],
       [ 92,  97,  85, ...,  68,  79,  88]], dtype=uint8)
```

In [99]:
```
horse_red[:,:,1]
```

Out[99]:
```
array([[21, 21, 21, ..., 19, 19, 19],
       [20, 21, 21, ..., 19, 19, 19],
       [20, 20, 20, ..., 19, 19, 19],
       ...,
       [69, 61, 66, ..., 94, 91, 89],
       [94, 89, 82, ..., 74, 77, 80],
       [69, 73, 63, ..., 50, 61, 70]], dtype=uint8)
```

In [101…
```
horse_red[:,:,2]
```

Out[101…
```
array([[10, 10, 10, ..., 13, 13, 13],
       [ 9, 10, 10, ..., 13, 13, 13],
       [ 9,  9,  9, ..., 13, 13, 13],
       ...,
       [31, 23, 29, ..., 72, 69, 67],
       [61, 58, 52, ..., 54, 57, 60],
       [38, 45, 39, ..., 30, 41, 50]], dtype=uint8)
```

In [103…
```
horse_red[:,:,1] = 0
```

In [105…
```
horse_red[:,:,1]
```

Out[105…
```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

In [107…
```
plt.imshow(horse_red)
```

Out[107…
```
<matplotlib.image.AxesImage at 0x20ef8ead670>
```

In [113…
```
horse_red[:,:,2]
```

Out[113…
```
array([[10, 10, 10, ..., 13, 13, 13],
       [ 9, 10, 10, ..., 13, 13, 13],
       [ 9,  9,  9, ..., 13, 13, 13],
       ...,
       [31, 23, 29, ..., 72, 69, 67],
       [61, 58, 52, ..., 54, 57, 60],
       [38, 45, 39, ..., 30, 41, 50]], dtype=uint8)
```

In [115…
```
horse_red[:,:,2] = 0
```

In [117…
```
horse_red[:,:,2]
```

Out[117…
```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

In [119…
```
plt.imshow(horse_red)
```

Out[119…
```
<matplotlib.image.AxesImage at 0x20ef96d9ca0>
```

In [121…
```
horse_arr
```

Out[121…

```
array([[[ 25,  21,  10],
        [ 25,  21,  10],
        [ 25,  21,  10],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       [[ 24,  20,   9],
        [ 25,  21,  10],
        [ 25,  21,  10],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       [[ 24,  20,   9],
        [ 24,  20,   9],
        [ 24,  20,   9],
        ...,
        [ 24,  19,  13],
        [ 24,  19,  13],
        [ 24,  19,  13]],

       ...,

       [[ 99,  69,  31],
        [ 91,  61,  23],
        [ 94,  66,  29],
        ...,
        [112,  94,  72],
        [109,  91,  69],
        [107,  89,  67]],

       [[120,  94,  61],
        [114,  89,  58],
        [107,  82,  52],
        ...,
        [ 92,  74,  54],
        [ 95,  77,  57],
        [ 98,  80,  60]],
```

```
[[ 92,  69,  38],
 [ 97,  73,  45],
 [ 85,  63,  39],
 ...,
 [ 68,  50,  30],
 [ 79,  61,  41],
 [ 88,  70,  50]]], dtype=uint8)
```

In [123…
```
horse_img
```

Out[123…

In [125…
```
horse_red
```

Out[125…

```
array([[[ 25,   0,   0],
        [ 25,   0,   0],
        [ 25,   0,   0],
        ...,
        [ 24,   0,   0],
        [ 24,   0,   0],
        [ 24,   0,   0]],

       [[ 24,   0,   0],
        [ 25,   0,   0],
        [ 25,   0,   0],
        ...,
        [ 24,   0,   0],
        [ 24,   0,   0],
        [ 24,   0,   0]],

       [[ 24,   0,   0],
        [ 24,   0,   0],
        [ 24,   0,   0],
        ...,
        [ 24,   0,   0],
        [ 24,   0,   0],
        [ 24,   0,   0]],

       ...,

       [[ 99,   0,   0],
        [ 91,   0,   0],
        [ 94,   0,   0],
        ...,
        [112,   0,   0],
        [109,   0,   0],
        [107,   0,   0]],

       [[120,   0,   0],
        [114,   0,   0],
        [107,   0,   0],
        ...,
        [ 92,   0,   0],
        [ 95,   0,   0],
        [ 98,   0,   0]],
```

```
[[ 92,   0,   0],
 [ 97,   0,   0],
 [ 85,   0,   0],
 ...,
 [ 68,   0,   0],
 [ 79,   0,   0],
 [ 88,   0,   0]]], dtype=uint8)
```

In [127…
```
arr1 = np.asarray(horse_img)
```

In [129…
```
type(arr1)
```

Out[129… numpy.ndarray

In [131…
```
plt.imshow(arr1)
```

Out[131… <matplotlib.image.AxesImage at 0x20ef98930b0>

In [133…
```
arr1.shape
```

Out[133…
```
(408, 612, 3)
```

In [159…
```
horse_img1 = arr1.copy()
```

In [137…
```
horse_img1[:,:,0] = 0
```

In [139…
```
plt.imshow(horse_img1)
```

Out[139…
```
<matplotlib.image.AxesImage at 0x20ef8e6e570>
```

In [163…
```
horse_img1[:,:,1] = 0
```

In [143…
```
plt.imshow(horse_img1)
```

Out[143…
```
<matplotlib.image.AxesImage at 0x20ef973ed50>
```

In [155…
```
horse_img1[:,:,2]
```

Out[155…
```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

In [151…
```
# horse_img1[:,:,2] = 0
```

In [165…
```
plt.imshow(horse_img1)
```

Out[165…
```
<matplotlib.image.AxesImage at 0x20efacab740>
```

In [167…
```
# practicle 1 is completed
```

In [ ]:
```
pip install pillow
```

In [ ]:
```

```