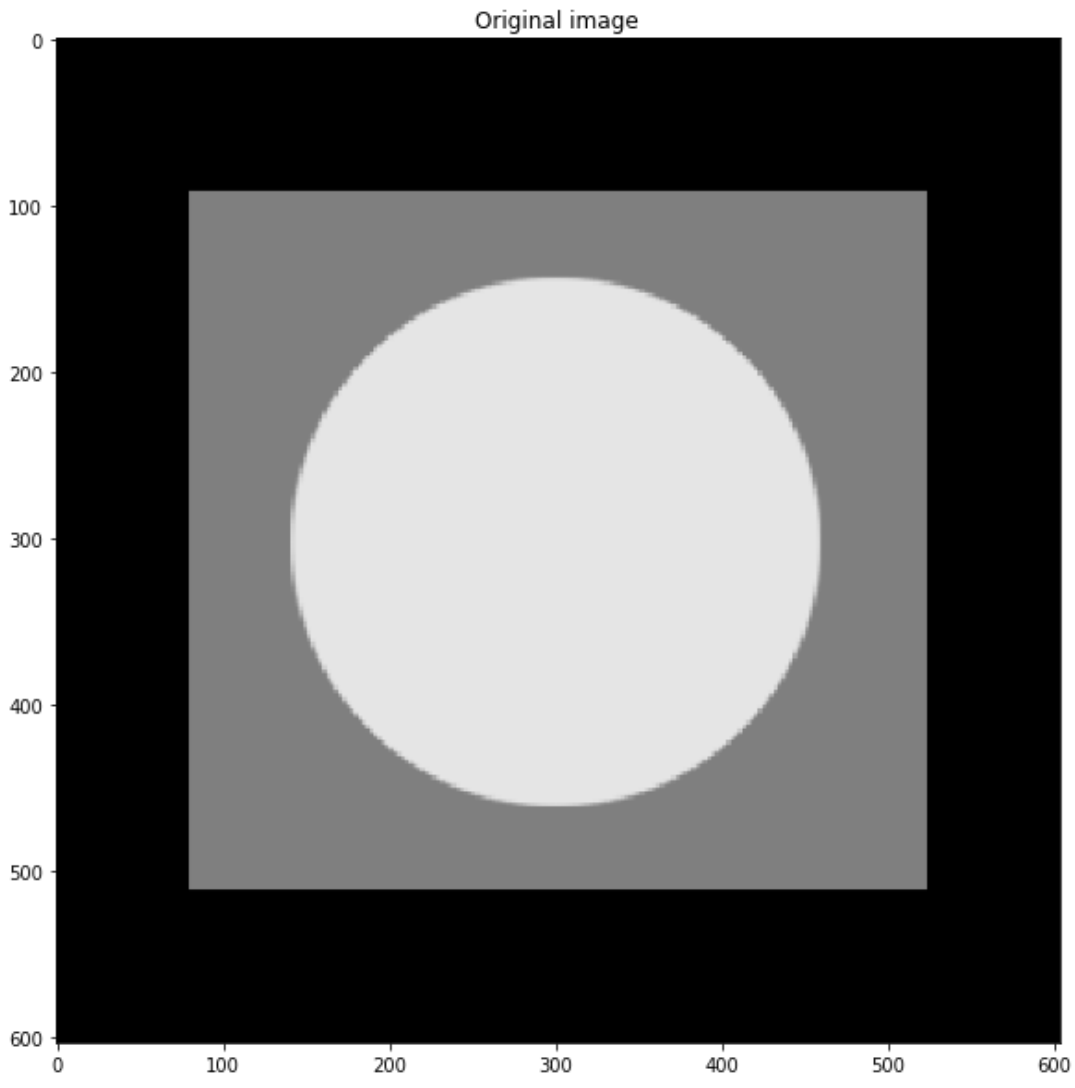
In [62]:

```
%matplotlib inline
from IPython.display import display, Math, Latex
import cv2
import random
import numpy as np
import matplotlib.pyplot as plt
import requests
from PIL import Image
from io import BytesIO

url = 'https://media.cheggcdn.com/media%2F2a9%2F2a90c92c-db23-4c83-ad8a-ae394c72a576%2Fphp2bN8Kd.png'
response = requests.get(url)
img = Image.open(BytesIO(response.content)).convert('L')

# display the image
figsize = (10,10)
plt.figure(figsize=figsize)

plt.imshow(img, cmap='gray', vmin=0, vmax=255)
plt.title("Original image")
```

Out[62]:

```
Text(0.5, 1.0, 'Original image')
```



In [69]:

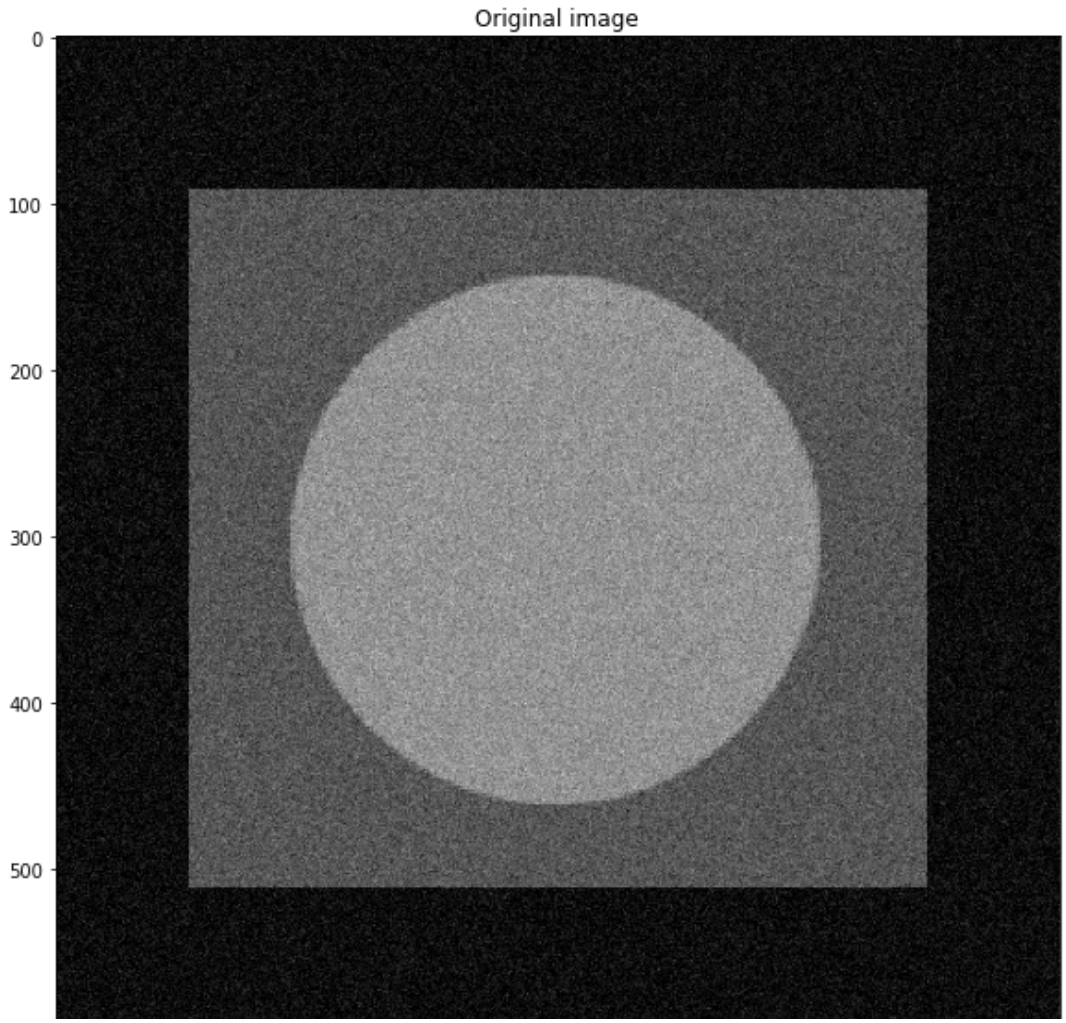
```
def exponential_distribution_noise(img):
  exponential = np.random.normal(8, 33, (img.shape[0],img.shape[1]))
  noisy_image = np.zeros(img.shape, np.float32)

  if len(img.shape) == 2:
    noisy_image = img + exponential
  else:
    noisy_image[:, :, 0] = img[:, :, 0] + exponential
    noisy_image[:, :, 1] = img[:, :, 1] + exponential
    noisy_image[:, :, 2] = img[:, :, 2] + exponential
  cv2.normalize(noisy_image, noisy_image, 0, 255, cv2.NORM_MINMAX, dtype=-1)
  noisy_image = noisy_image.astype(np.uint8)
  alpha = -50
  beta = 30
  noisy_image = np.int16(noisy_image)
  noisy_image = noisy_image * (beta/127+1) - beta + alpha
  noisy_image = np.clip(noisy_image, 0, 255)
  noisy_image = np.uint8(noisy_image)
  return noisy_image
```

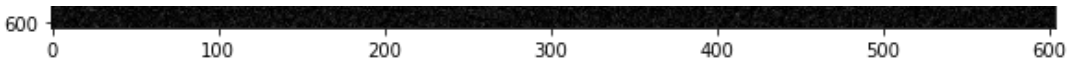
In [70]:

```
img = np.asarray(img)
noise_image = exponential_distribution_noise(img)

# display the image
figsize = (10,10)
plt.figure(figsize=figsize)

plt.imshow(noise_image, cmap='gray', vmin=0, vmax=255)
plt.title("Original image")
```

Out[70]:

```
Text(0.5, 1.0, 'Original image')
```




600
0
100
200
300
400
500
600