In [273]:

```
import cv2
import numpy as np
from matplotlib import pyplot as plt
```

In [274]:

```
filename="img3.jpg"
```

In [275]:

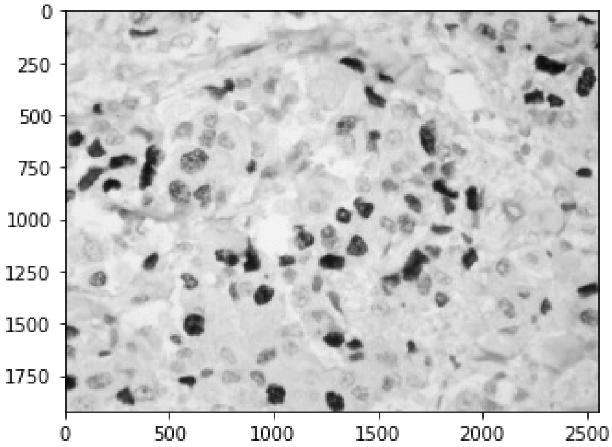
```
img = cv2.imread(filename,0)
```

In [276]:

```
plt.imshow(img,cmap="gray")
```

Out[276]:

```
<matplotlib.image.AxesImage at 0x7f505f97d470>
```



In [ ]:

```

```

In [277]:

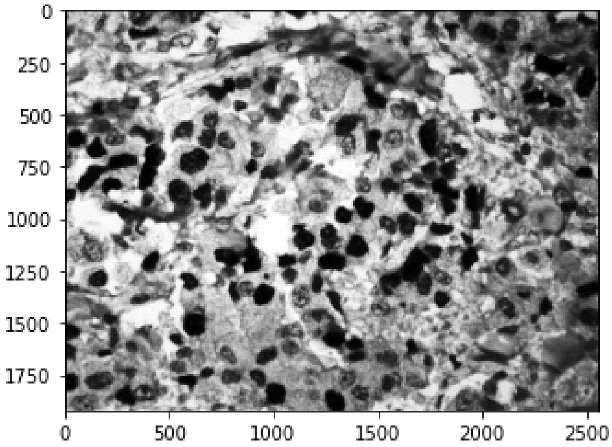
```
equ = cv2.equalizeHist(img)
```

In [278]:

```
plt.imshow(equ,cmap="gray")
```

Out[278]:

```
<matplotlib.image.AxesImage at 0x7f505f8e2a90>
```



In [ ]:

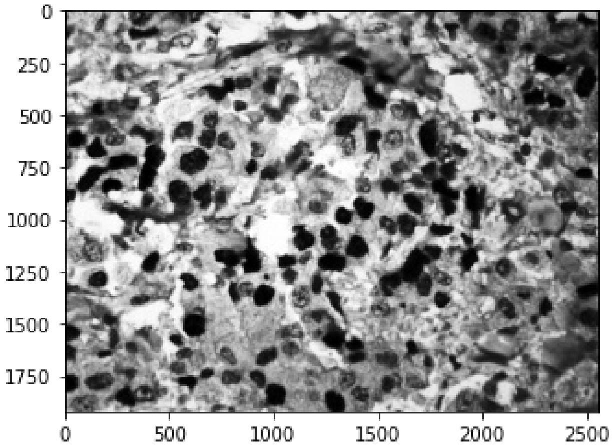
```
```

In [279]:

```
Gaussian = cv2.GaussianBlur(equ, (5, 5), 0)
plt.imshow(Gaussian,cmap="gray")
# cv2.imshow('Gaussian Blurring', Gaussian)
# cv2.waitKey(0)
# cv.destroyAllWindows()
```

Out[279]:

```
<matplotlib.image.AxesImage at 0x7f505f841eb8>
```

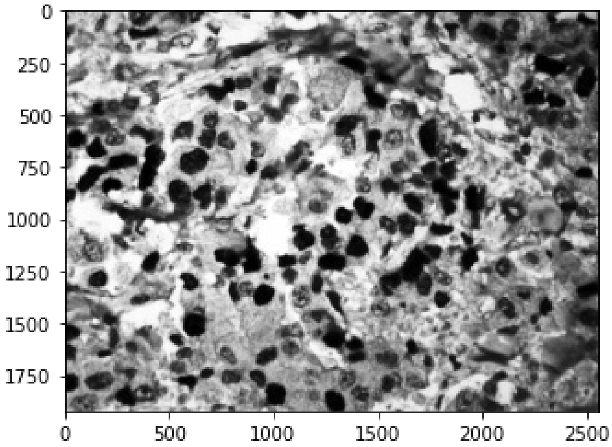


In [280]:

```
kernel = np.ones((5,5),np.uint8)
closing = cv2.morphologyEx(Gaussian, cv2.MORPH_CLOSE, kernel)
plt.imshow(closing,cmap="gray")
```

Out[280]:

```
<matplotlib.image.AxesImage at 0x7f505f82bba8>
```

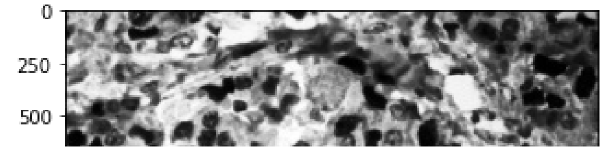


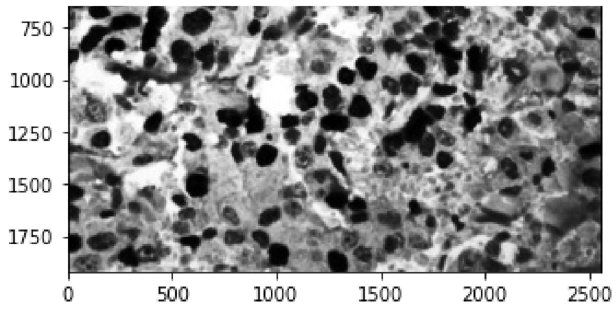
In [281]:

```
kernel = np.ones((5,5),np.uint8)
erosion = cv2.erode(closing,kernel,iterations = 1)
plt.imshow(erosion,cmap="gray")
```

Out[281]:

```
<matplotlib.image.AxesImage at 0x7f505f797668>
```

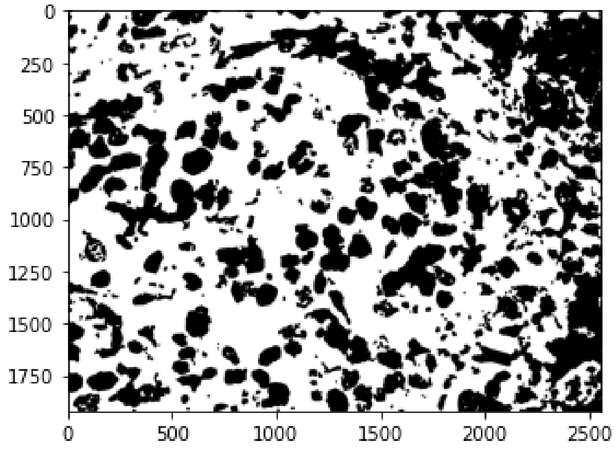




In [282]:

```
# edged = cv2.Canny(erosion, 30, 200)
# plt.imshow(edged)
# ret, thresh = cv.threshold(edged, 127, 255, 0)

ret, thresh = cv2.threshold(erosion, 100, 255,0)
plt.imshow(thresh,cmap="gray")
contours, _ = cv2.findContours(thresh, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)
```

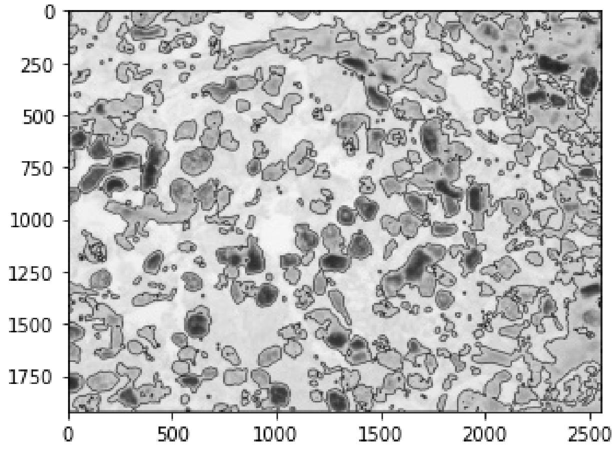


In [283]:

```
cv2.drawContours(img,contours, -1, (0, 255, 0), 3)
plt.imshow(img,cmap="gray")
# cv2.imshow('Contours', img)
# cv2.waitKey(0)
# cv2.destroyAllWindows()
```

Out[283]:

```
<matplotlib.image.AxesImage at 0x7f505f6ef080>
```



In [284]:

```
print("Number of Contours found = " + str(len(contours)))
```

```
Number of Contours found = 560
```

In [285]:

```
tot = (len(contours))
```

In [ ]:

```

```

In [ ]:

```

```

In [286]:

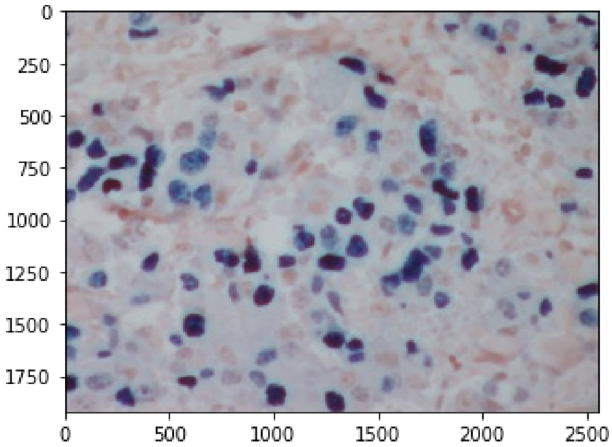
```
img = cv2.imread(filename)
Gaussian = cv2.GaussianBlur(img, (9,9), 0)
#plt.imshow(Gaussian,cmap="gray")

kernel = np.ones((7,7),np.uint8)
closing = cv2.morphologyEx(Gaussian, cv2.MORPH_CLOSE, kernel)
#plt.imshow(closing,cmap="gray")

kernel = np.ones((7,7),np.uint8)
erosion = cv2.erode(closing,kernel,iterations = 1)
plt.imshow(erosion)
```

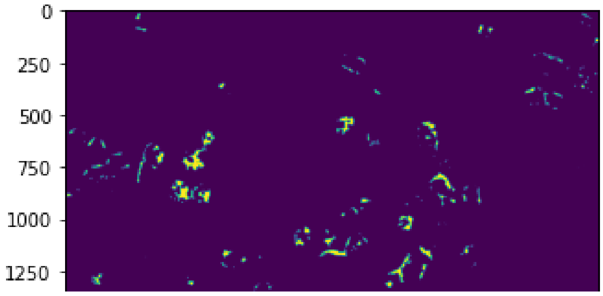
Out[286]:

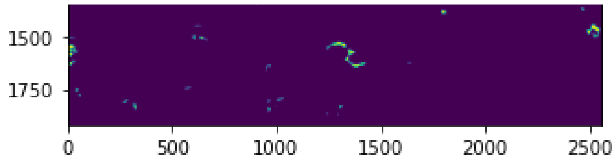
```
<matplotlib.image.AxesImage at 0x7f505f654128>
```



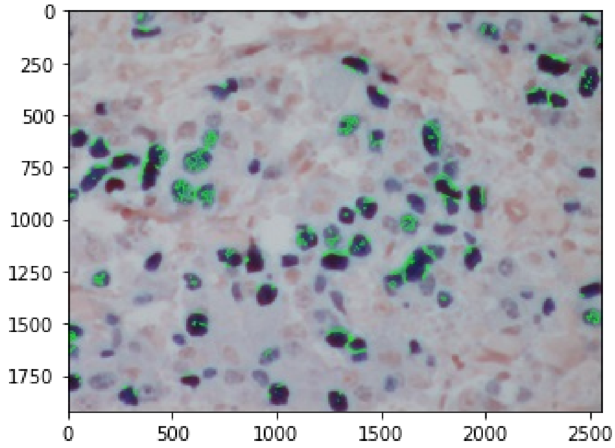
In [287]:

```
#img = cv2.imread("img1.jpg")
img = erosion
hsv = cv2.cvtColor(img, cv2.COLOR_BGR2HSV)
mask = cv2.inRange(hsv,(10, 85, 20), (25, 240, 255) )
plt.imshow(mask)
plt.show()
##cv2.imshow("orange", mask);cv2.waitKey();cv2.destroyAllWindows()
#plt.imshow(mask,cmap="gray")
ret, thresh = cv2.threshold(mask, 100, 255,0)
plt.imshow(thresh,cmap="gray")
contours, _ = cv2.findContours(thresh, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)
cv2.drawContours(img,contours, -1, (0, 255, 0), 3)
plt.imshow(img,cmap="gray")
#plt.show()
print("Number of Contours found = " + str(len(contours)))
```





```
Number of Contours found = 303
```



In [288]:

```
brown = len(contours)
```

In [289]:

```
percent = brown/tot*100
print("Percentage of positivity = ",percent,"%")
```

```
Percentage of positivity =  54.107142857142854 %
```

In [290]:

```
if(percent>15):
    print("High grade")
else:
    print("Low grade")
```

```
High grade
```

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]: