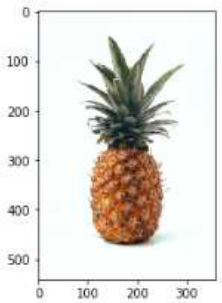
pic_vision4

In [1]:
```
import cv2
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

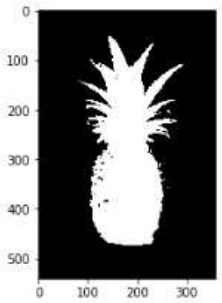
In [2]:
```
# Load the image
img = cv2.imread('pine_apple.jpg')
img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
plt.imshow(img)
```

Out[2]: <matplotlib.image.AxesImage at 0x24f193cbf60>



In [3]:
```
# Blurring for removing the noise
img_blur = cv2.bilateralFilter(img, d = 7,
                               sigmaSpace = 75, sigmaColor =75)
# Convert to grayscale
img_gray = cv2.cvtColor(img_blur, cv2.COLOR_RGB2GRAY)
# Apply the thresholding
a = img_gray.max()
_, thresh = cv2.threshold(img_gray, a/2+60, a,cv2.THRESH_BINARY_INV)
plt.imshow(thresh, cmap = 'gray')
```

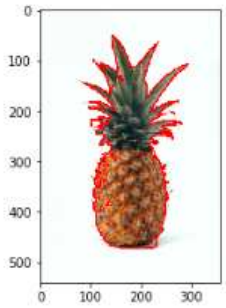
Out[3]: <matplotlib.image.AxesImage at 0x24f1a40fd68>



In [4]:
```
# Find the contour of the figure
contours, hierarchy = cv2.findContours(thresh, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)
```

In [5]:
```
# Sort the contours
contours = sorted(contours, key = cv2.contourArea, reverse = True)
# Draw the contour
img_copy = img.copy()
final = cv2.drawContours(img_copy, contours, contourIdx = -1,
                         color = (255, 0, 0), thickness = 2)
plt.imshow(img_copy)
```

Out[5]: <matplotlib.image.AxesImage at 0x24f1a451320>



In [6]:
```
# The first order of the contours
c_0 = contours[0]
# image moment
M = cv2.moments(c_0)
print(M.keys())
```

```
dict_keys(['nu11', 'nu20', 'mu02', 'mu03', 'nu03', 'm02', 'm10', 'm03', 'nu30', 'mu20', 'm21', 'm30', 'm0
1', 'mu11', 'mu30', 'mu12', 'nu21', 'm00', 'mu21', 'm11', 'nu02', 'm20', 'm12', 'nu12'])
```

In [7]:
```
# The area of contours
print("1st Contour Area : ", cv2.contourArea(contours[0])) # 37544.5
print("2nd Contour Area : ", cv2.contourArea(contours[1])) # 75.0
print("3rd Contour Area : ", cv2.contourArea(contours[2])) # 54.0
```

```
1st Contour Area :  44140.0
2nd Contour Area :  63.0
3rd Contour Area :  60.5
```

In [8]:
```
# The arc length of contours
print(cv2.arcLength(contours[0], closed = True))      # 2473.3190
print(cv2.arcLength(contours[0], closed = False))     # 2472.3190
```

```
2489.5373505353928
2488.5373505353928
```

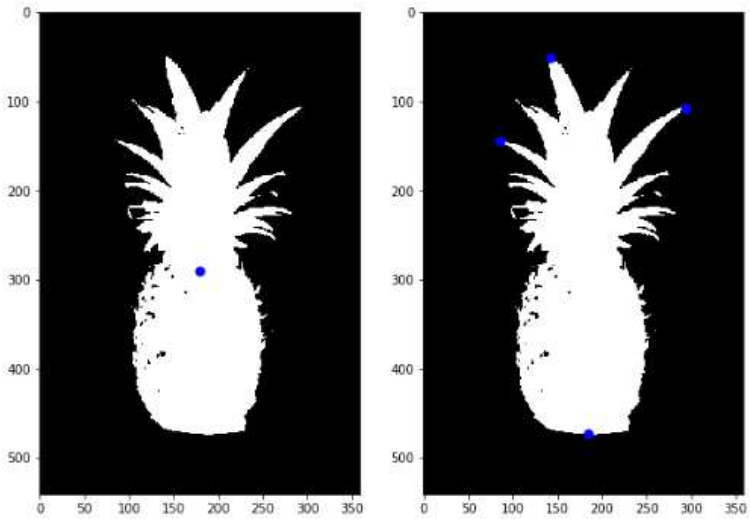
In [9]:
```
# The centroid point
cx = int(M['m10'] / M['m00'])
cy = int(M['m01'] / M['m00'])
```

In [10]:
```
# The extreme points
l_m = tuple(c_0[c_0[:, :, 0].argmin()][0])
r_m = tuple(c_0[c_0[:, :, 0].argmax()][0])
t_m = tuple(c_0[c_0[:, :, 1].argmin()][0])
b_m = tuple(c_0[c_0[:, :, 1].argmax()][0])
pst = [l_m, r_m, t_m, b_m]
xcor = [p[0] for p in pst]
ycor = [p[1] for p in pst]
```

In [11]:
```
# Plot the points
plt.figure(figsize = (10, 16))
plt.subplot(1, 2, 1)
plt.imshow(thresh, cmap = 'gray')
plt.scatter([cx], [cy], c = 'b', s = 50)
plt.subplot(1, 2, 2)
plt.imshow(thresh, cmap = 'gray')
plt.scatter(xcor, ycor, c = 'b', s = 50)
```

Out[11]: <matplotlib.collections.PathCollection at 0x24f1a4b1048>

Out[11]: <matplotlib.collections.PathCollection at 0x24f1a4b1048>

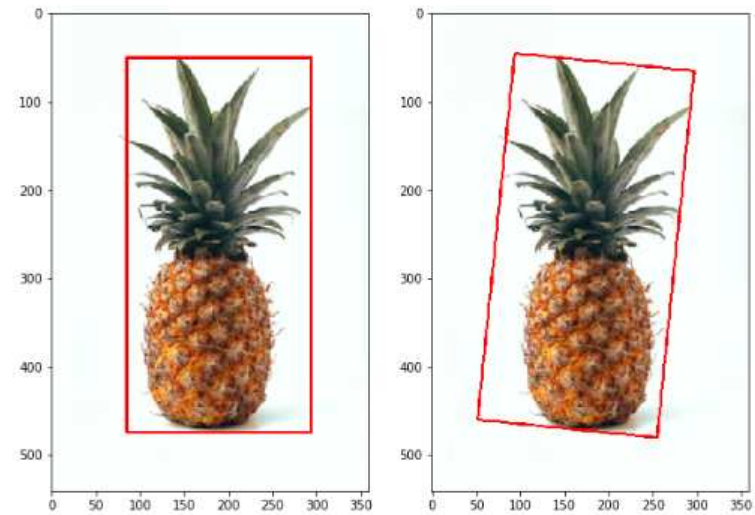


In [12]:
```
# The first order of the contours
c_0 = contours[0]
# Get the 4 points of the bounding rectangle
x, y, w, h = cv2.boundingRect(c_0)
# Draw a straight rectangle with the points
img_copy = img.copy()
img_box = cv2.rectangle(img_copy, (x, y), (x+w, y+h), color = (255, 0, 0), thickness = 2)
```

In [13]:
```
# Get the 4 points of the bounding rectangle with the minimum area
rect = cv2.minAreaRect(c_0)
box = cv2.boxPoints(rect)
box = box.astype('int')
# Draw a contour with the points
img_copy = img.copy()
img_box_2 = cv2.drawContours(img_copy, contours = [box],
                             contourIdx = -1,
                             color = (255, 0, 0), thickness = 2)
```

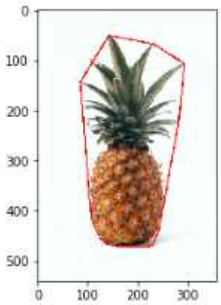
In [14]:
```
plt.figure(figsize = (10, 16))
plt.subplot(1, 2, 1); plt.imshow(img_box)
plt.subplot(1, 2, 2); plt.imshow(img_box_2)
```

Out[14]: <matplotlib.image.AxesImage at 0x24f1a4d1e80>



In [15]:
```
# Detect the convex contour
hull = cv2.convexHull(c_0)
img_copy = img.copy()
img_hull = cv2.drawContours(img_copy, contours = [hull],
                            contourIdx = 0,
                            color = (255, 0, 0), thickness = 2)
plt.imshow(img_hull)
```

Out[15]:
```
<matplotlib.image.AxesImage at 0x24f1a553c88>
```

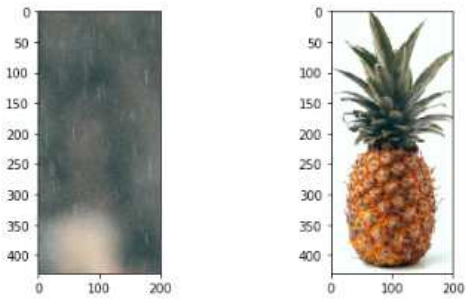


In [16]:
```
# Import the large image
backpacker = cv2.imread('back.jpg')
backpacker = cv2.cvtColor(backpacker, cv2.COLOR_BGR2RGB)
plt.imshow(backpacker)
```

Out[16]:
```
<matplotlib.image.AxesImage at 0x24f1a58aac8>
```

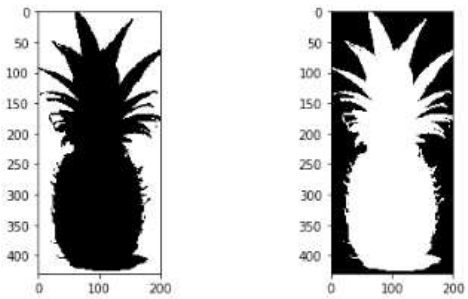
In [20]:
```
# Crop the small image and the roi
roi = backpacker[770:1200, 300:500]
img_2 = img[50:480, 80:280]
plt.figure(figsize = (6, 6))
plt.subplot(1, 3, 1); plt.imshow(roi)
plt.subplot(1, 3, 3); plt.imshow(img_2)
```

Out[20]:
```
<matplotlib.image.AxesImage at 0x24f1a7306d8>
```

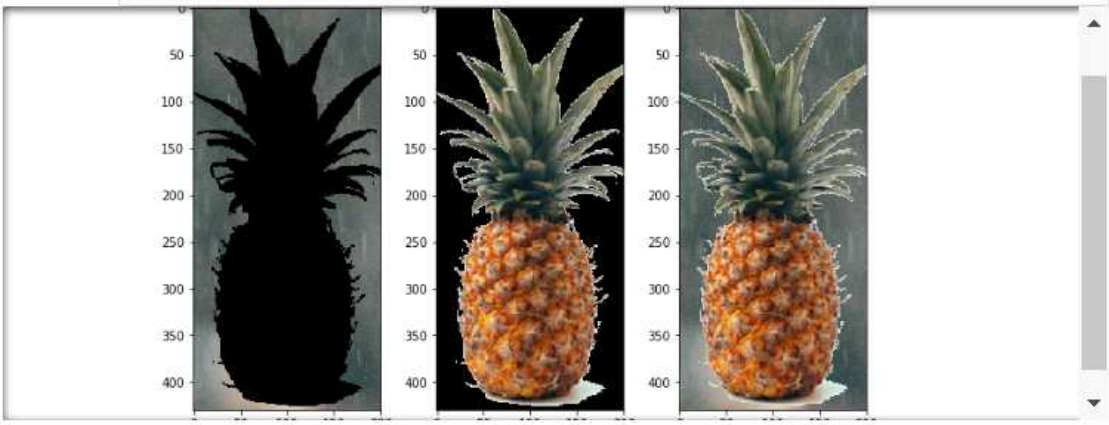


In [21]:
```
# Creating the mask for the roi and small image
img_gray = cv2.cvtColor(img_2, cv2.COLOR_RGB2GRAY)
_, mask = cv2.threshold(img_gray, 254/2+100, 255, cv2.THRESH_BINARY)
mask_inv = cv2.bitwise_not(mask)
plt.figure(figsize = (6, 6))
plt.subplot(1, 3, 1); plt.imshow(mask, cmap = 'gray')
plt.subplot(1, 3, 3); plt.imshow(mask_inv, cmap = 'gray')
```

Out[21]:
```
<matplotlib.image.AxesImage at 0x24f1a79e4a8>
```



In [22]:
```
# Masking
img_bg = cv2.bitwise_and(roi, roi, mask = mask)
img_fg = cv2.bitwise_and(img_2, img_2, mask = mask_inv)
dst = cv2.add(img_fg, img_bg)
plt.figure(figsize = (10, 6))
plt.subplot(1, 3, 1); plt.imshow(img_bg)
plt.subplot(1, 3, 2); plt.imshow(img_fg)
plt.subplot(1, 3, 3); plt.imshow(dst)
```



In [23]:
```
# Final output
backpacker[770:1200, 300:500] = dst
display(backpacker)
```

```
array([[[75, 88, 81],
        [77, 86, 83],
        [85, 84, 89],
        ...,
        [53, 65, 61],
        [52, 63, 59],
        [55, 66, 62]],

       [[75, 88, 81],
        [86, 97, 93],
        [82, 87, 90],
        ...,
        [46, 65, 61],
        [46, 62, 59],
        [45, 61, 58]],

       [[65, 80, 73],
        [81, 96, 91],
        [77, 92, 89],
```