

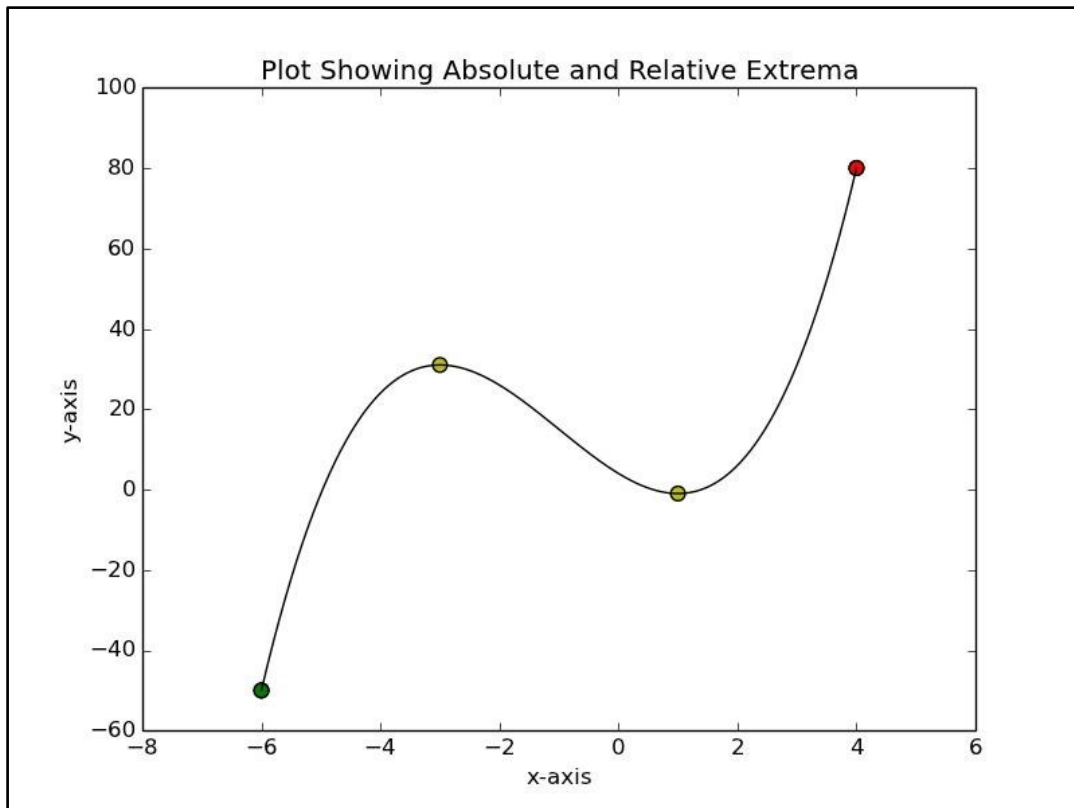
## **Module 7 Answers**

### **Module 7 Practice 1**

**Exercise 1:** Refer to Lial Section 13.1 Example 2. Reproduce Figure 7.  
(Use the statements below and the same plotting code as shown in the module.)

```
plt.figure()
def f(x):
    y= x**3+3.0*x**2-9*x+4.0
    return y
xa= -6.0
xb= +4.0
```

**Output:**



**Exercise 2:** Refer to Lial Section 14.1 Example 3. Evaluate over the interval [0,10] and produce a plot showing maxima and minima. Compare to the answer sheet.  
(Use the statements below and the same plotting code as shown in the module.)

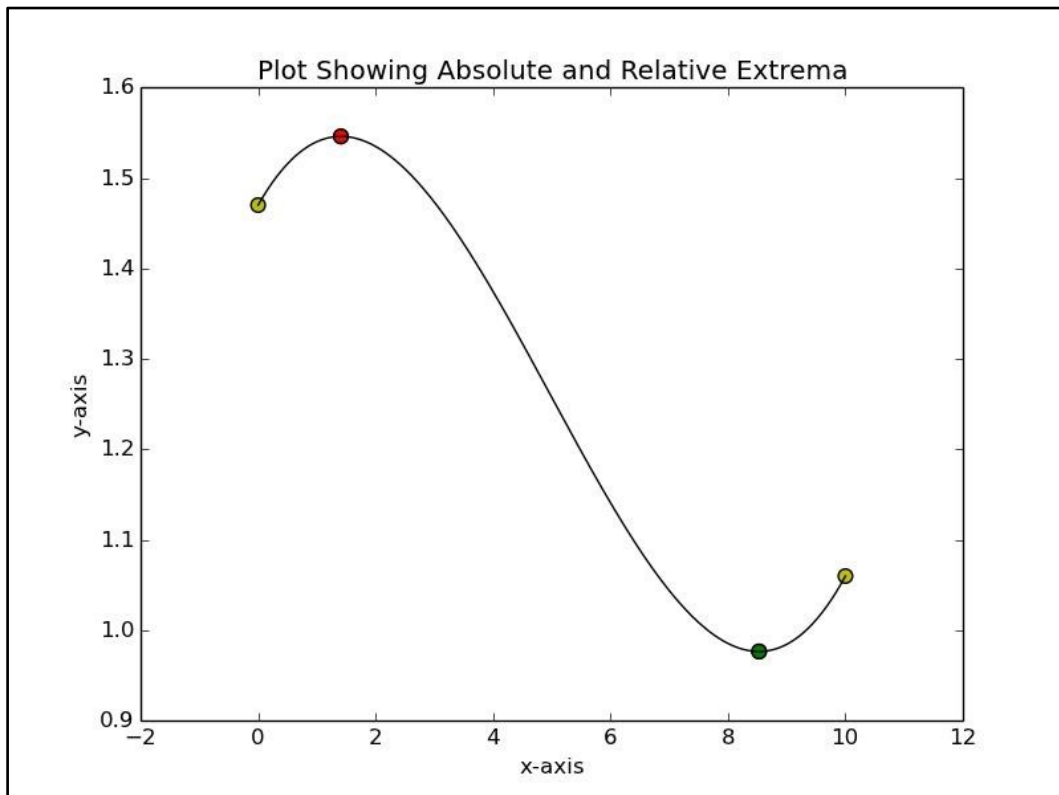
```
plt.figure()
def f(x):
```

```

y= 0.00316*x**3-0.0471*x**2+0.114*x+1.47
return y
xa= 0.0
xb= +10.0

```

**Output:**



Exercise: Refer to Lial Section 14.1 Example 2. Duplicate the results showing plots of the function and derivatives. Compare to the answer sheet. (Use the statements below and the same plotting code as shown in the module.)

```

import numpy as np
import matplotlib.pyplot as plt

plt.figure()
p=np.poly1d([3,-4,-12,0,2])
print ('\nFourth Degree Polynomial')
print (p)
print ('\nFirst Derivative')
g= p.deriv(m=1) # First derivative with m=1.

```

```

print (g)
print ('\nSecond Derivative')
q= p.deriv(m=2) # Second derivative with m=2.
print (q)
x=np.linspace(-2,3,101)
y=p(x)
yg=g(x) # These statements define points for plotting.
yq=q(x)
y0=0*x # This statement defines the y axis for plotting.

```

### **Output:**

Fourth Degree Polynomial

$$3x^4 - 4x^3 - 12x^2 + 2$$

First Derivative

$$12x^3 - 12x^2 - 24x$$

Second Derivative

$$36x^2 - 24x - 24$$

