1. (20 Points) The following questions will be dealing with the function $f(x) = |\sin(x)|^x \cos(x)$.

(a) Graph the function on the interval $[-5, 2]$ and draw it below.

(b) From the graph of the function how many critical numbers does the function have on $[-5, 2]$?

**Solution:** From the graph it appears that there are 7 critical points.

(c) From the graph of the function how many local maximums and minimums does the function have on $[-5, 2]$?

**Solution:** From the graph it appears that there are two local minimums and one local maximum.

(d) Find $f'(x)$ and write down what Maple gave you as an answer.

**Solution:**

$$f'(x) = \sin(x)^{x\cos(x)} \left( (x - \sin(x)) \ln(|\sin(x)|) + \frac{x \cos(x)^2 \text{abs}(1, \sin(x))}{\sin(x)} \right)$$

(e) Find the $x$ values for each of the local maximums and minimums to at least 6 decimal places.

**Solution:** $x = -0.3416058396$, $x = 0.3416058396$ and $x = -3.141592654$. 
2. (10 Points) The following questions will be dealing with the function,

\[ f(x) = \left( \frac{\ln(x)}{x} \right)^x \]

(a) This function has one local maximum, find it to at least 6 decimal places. List the Maple commands you used.
   **Solution:** The maximum is at \( x = 1.557433543 \) and the commands needed are
   
   ```maple
   g:=x->(ln(x)/x)^x;
   fsolve(diff(g(x),x),x);
   ```

(b) This function has one point of inflection, find it to at least 6 decimal places. List the Maple commands you used.
   **Solution:** The point of inflection is at \( x = 2.220705029 \) and the commands needed are
   
   ```maple
   g:=x->(ln(x)/x)^x;
   fsolve(diff(g(x),x,x),x);
   ```