1.) Do detailed graphing (See instruction sheet from class.) for each function
   
   a.) \( y = x(x - 4) \) on the interval \([0, 5]\)
   
   b.) \( y = x(x - 5)^4 \)
   
   c.) \( f(x) = \frac{3x^2}{x - 4} \)
   
   d.) \( f(x) = 4\sqrt{x} - x \)

2.) Consider the function \( f(x) = 1 - x^{2/3} \) on the interval \([-1, 1]\). Show that \( f(1) = f(-1) = 0 \) but that \( f'(x) \) is never zero on the interval \([-1, 1]\). Explain how this is possible, in view of the Mean Value Theorem.

3.) Let \( f(x) = \begin{cases} 
  -x^2, & \text{if } -1 \leq x \leq 0 \\
  x^2(x - 1), & \text{if } 0 < x \leq 2
\end{cases} \)

   a.) Sketch the graph of \( f \).
   
   b.) Show that \( f \) satisfies the conditions of the Mean Value Theorem (MVT) over the interval \([-1, 2]\), including special attention at \( x = 0 \), and determine all values of \( c \) guaranteed by the MVT.

4.) Use a linearization to estimate the value of

   a.) \( \sqrt{150} \) 
   
   b.) \( e^{0.1} \)

5.) The radius of a circle is measured with absolute percentage error of at most 3%. Use differentials to estimate the maximum absolute percentage error in computing the circle’s

   a.) circumference. 
   
   b.) area.

   (RECALL: For a circle: circumference \( C = 2\pi r \) and area \( A = \pi r^2 \).)

6.) The radius of a sphere is measured with absolute percentage error of at most 4%. Use differentials to estimate the maximum absolute percentage error in computing the sphere’s

   a.) surface area. 
   
   b.) volume.

   (RECALL: For a sphere: surface area \( S = 4\pi r^2 \) and volume \( V = (4/3)\pi r^3 \).)

The following problem is for recreational purposes only.

7.) Find a hidden pattern and determine the next number in the sequence:

   0, 1, 3, 7, 14, 25, 41, 63, \ldots