1. Sketch a graph of a function $f$ that is continuous on $[0, 4]$ and satisfies the given properties.
   a. $f'(x) = 0$ when $x = 1$ and 2; $f$ has an absolute maximum at $x = 4$; $f$ has an absolute minimum at $x = 0$; $f$ has a local minimum at $x = 2$.
   b. $f'(x) = 0$ when $x = 1, 2, \text{ and } 3$; $f$ has an absolute minimum at $x = 1$; $f$ has no local extremum at $x = 2$; $f$ has a local maximum at $x = 3$.
   c. $f'(x)$ is undefined when $x = 1$ and 3; $f'(2) = 0$; $f$ has a local maximum at $x = 1$; $f$ has a local minimum at $x = 2$; $f$ has an absolute maximum at $x = 3$; $f$ has an absolute minimum at $x = 4$.

2. Sketch the graph of $f(x) = x^2 - 4x + 3$.

3. Let $f(x) = x\sqrt{3-x}$.
   a. Find the domain of $f(x)$.
   b. Determine the $x$-coordinates of the local maxima and minima (if any) and intervals where $f(x)$ is increasing or decreasing.
   c. Determine intervals where $f(x)$ is concave upwards or downwards, and the $x$ coordinates of inflection points (if any). You may use the formula $f''(x) = \frac{(3x - 12)(3-x)^{-3/2}}{4}$.
   d. There is a point at which the the curve $y = f(x)$ has a vertical tangent line. Find this point.
   e. Sketch the graph $y = f(x)$, showing the features given in items (a) to (d) above and giving the $(x, y)$ coordinates for all points occurring above.

4. The first and second derivatives of the function $f(x) = \frac{3x+2}{2x-4}$ are:
   
   
   $f'(x) = -\frac{4}{(x-2)^2}$ and $f''(x) = \frac{8}{(x-2)^3}$.

   Graph $f(x)$. Include local and absolute maxima and minima, regions where $f(x)$ is increasing or decreasing, regions where the curve is concave upward or downward, and any asymptotes.

5. The first and second derivatives of the function $f(x) = \frac{1}{x^2 - 1}$ are:
   
   $f'(x) = -\frac{2x}{(x^2 - 1)^2}$ and $f''(x) = \frac{6x^2 + 2}{(x^2 - 1)^3}$.

   Graph $f(x)$. Include local and absolute maxima and minima, regions where $f(x)$ is increasing or decreasing, regions where the curve is concave upward or downward, and any asymptotes.

6. Graph $f(x) = 1 - \frac{3}{x} + \frac{4}{x^3}$. Include local and absolute maxima and minima, regions where $f(x)$ is increasing or decreasing, regions where the curve is concave upward or downward, and any asymptotes.

7. The first and second derivatives of the function $f(x) = \frac{x^3}{x - 1}$ are:
   
   $f'(x) = \frac{x^2(2x - 3)}{(x - 1)^2}$ and $f''(x) = \frac{2x(x^2 - 3x + 3)}{(x - 1)^3}$.

   Graph $f(x)$. Include local and absolute maxima and minima, regions where $f(x)$ is increasing or decreasing, regions where the curve is concave upward or downward, and any asymptotes.