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 $x = 1, 2$, 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 $f''(x) = \dfrac{(3x - 12)(3 - x)^{-3/2}}{4}$.

   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 $f(x) = \dfrac{3x + 2}{2x - 4}$ are:

$$f'(x) = -\frac{4}{(x-2)^2} \qquad \text{and} \qquad f''(x) = \frac{8}{(x-2)^3}.$$

   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 $f(x) = \dfrac{1}{x^2 - 1}$ are:

$$f'(x) = -\frac{2x}{(x^2-1)^2} \qquad \text{and} \qquad f''(x) = \frac{6x^2 + 2}{(x^2-1)^3}.$$

   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 $f(x) = 1 - \dfrac{3}{x} + \dfrac{4}{x^3}$. 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 $f(x) = \dfrac{x^3}{x - 1}$ are:

$$f'(x) = \frac{x^2(2x-3)}{(x-1)^2} \qquad \text{and} \qquad f''(x) = \frac{2x(x^2 - 3x + 3)}{(x-1)^3}.$$

   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.