Show important algebraic steps. Partial credit can be given only if work is clearly shown. If writing a sentence, use complete, correct English sentences.

1. The weekly cost of producing $q$ refrigerators is given by
   $C(q) = 2q^2 + 15q + 1500$, $0 \leq q \leq 200$.
   The revenue from selling $q$ refrigerators is $R(q) = -0.3q^2 + 460q$. (3 pts. each)
   a) Find the marginal cost, $MC$, when $q = 145$.

   1.a) __________

   b) Find the marginal revenue, $MR$, when $q = 145$.

   b) __________

   c) At a production level of $q = 145$ refrigerators, should production be increased or decreased. Use $MC$ and $MR$ to clearly explain your answer.

2. The height of a sand dune (in centimeters) is represented by $f(t) = 600 - 3t^2$, where $t$ is years since 1995. (3 pts. each)
   a) Find $f(4)$

   2.a) __________

   b) Interpret, in the context of this problem, the meaning of $f(4)$ found in part a). (3 pts.)

   c) Find $f'(4)$

   2.c) __________

   d) Interpret, in the context of this problem, $f'(4)$ found in part c). (3 pts.)

3. A can of soda is put into a refrigerator to cool. The temperature $H$ (in degrees Fahrenheit) is a function of time $t$, in hours, and is given by: (3 pts. each)
   $H = 40 + 30e^{-2t}$.
   a) Find the rate at which the temperature of the soda is changing (in °F/hour).

   3) ________________

   b) Explain the meaning of $\frac{dH}{dt}$ in terms of the can of soda.
4. During the 1990s, the population of Hungary was approximated by

\[ P = 10.8(0.998)^t \]

where \( P \) is in millions and \( t \) is in years since 1990. (4 pts. each)

a) Find \( \frac{dp}{dt} \), the rate of change of the population with respect to time \( t \).

b) What is the rate of change of the population in the year 2000 (\( t = 10 \))? Use a calculator and round to 2 decimal places. Is the population increasing or decreasing? Include appropriate units!

5. Use the given graph to answer the following questions. (2 pts. each)

a) At which of the labeled point(s), if any, is \( \frac{dy}{dx} \) positive and \( \frac{d^2y}{dx^2} \) negative? 

b) At which of the labeled points, if any, is \( \frac{dy}{dx} = 0 \)? 

c) At which of the labeled points, if any, \( \frac{d^2y}{dx^2} = 0 \)?

6. Refer to the given graph to determine the points, if any, that are local or global extrema. Answer with ordered pairs. (2 pts. each)

a) List all points that are local maxima.

b) List all points, if any, that are local minima.

c) List all points, if any, that are global maxima.

d) List all points, if any, that are global minima.
7. Find the first derivative of the following functions.

(6 pts.) a) \( y = \frac{5}{x^7} + \frac{8}{\sqrt{x}} \)

(6 pts.) b) \( y = \ln(7x - 2) \)

(7 pts.) c) \( y = x^2 \left( 3x + 2 \right)^{3/2} \)

b) 

c) 

8. Given \( f(x) = \frac{2x - 5}{x - 1} \).

a) Find the slope of the line tangent to the graph of \( f \) at \( x = 3 \). (5 pts.)

b) Write the equation of the tangent line to the graph of \( f \) at \( x = 3 \). (5 pts.)
9. Given \( f(x) = x^3 + 3x^2 - 4 \). (3 pts. each)

   a) Find \( f'(x) \)

   b) Find \( f''(x) \)

   c) Find all critical points.

   d) Find all possible inflection points.

9.a) 

b) 

c) 

d) 

10. A function as well as its first and second derivatives are given below:

\[
\begin{align*}
f(x) &= -\frac{1}{3} x^3 + 3x^2 - 5x; \\
f'(x) &= -x^2 + 6x - 5; \\
f''(x) &= -2x + 6.
\end{align*}
\]

   a) \( x = 1 \) is a critical point. Use the First Derivative Test to identify it as a local maximum, local minimum or neither. CLEARLY show work and justify your answer! (5 pts.)

   b) \( x = 5 \) is also a critical point. Use the Second Derivative Test to identify it as a local maximum, local minimum or neither. CLEARLY show work and justify your answer! (5 pts.)