Math 122 Worksheet 4

Show all work for full credit.

1. Given the following data about a function \( f(x) \),

\[
\begin{array}{c|ccccccc}
 x & 5 & 10 & 15 & 20 & 25 & 30 & 35 \\
f(x) & 160 & 245 & 280 & 265 & 200 & 185 & 90 \\
\end{array}
\]

a. Estimate \( f'(30) \).

b. Use your answer from (a) to write the equation of the tangent line to \( f(x) \) at \( x = 30 \).

2. During a night in Las Vegas, the number of people, \( P \), at a popular nightclub is a function of time, \( t \), in hours since 8pm, so \( P = f(t) \). Explain the meaning of the statement \( f'(3) = 25 \) in terms of people in the club and time.

3. Suppose \( E(x) \) is the fuel efficiency (in miles per gallon, MPG) of an average American compact car traveling at a speed of \( x \) miles per hour, MPH. Answer each of the following.
   a. What are the units of \( E'(x) \)?
   b. Explain in everyday language the meaning of \( E'(55) < 0 \).

4. Suppose that \( f(x) \) is a function with \( f(35) = 18 \) and \( f'(35) = -2.8 \).
   a. Estimate \( f(37) \)

b. If the actual value is \( f(37) = 13 \), what does your answer in (a) tell you about the concavity of \( f(x) \) close to \( x = 35 \)? Explain.
5. Given the graph of $f(x)$, sketch the graph of $f'(x)$ on the same set of axes.

6. The graph of $y = f(x)$ is given. Are the following quantities positive, negative, or zero?

   a. $f(A)$
   b. $f'(A)$
   c. $f''(A)$
   d. $f(B)$
   e. $f'(B)$
   f. $f''(B)$
   g. $f(C)$
   h. $f'(C)$
   i. $f''(C)$
   j. $f(D)$
   k. $f'(D)$
   l. $f''(D)$