Math 261 - Lab 15

The First Derivative Test

Name:

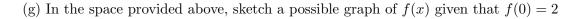
Show all work for credit.

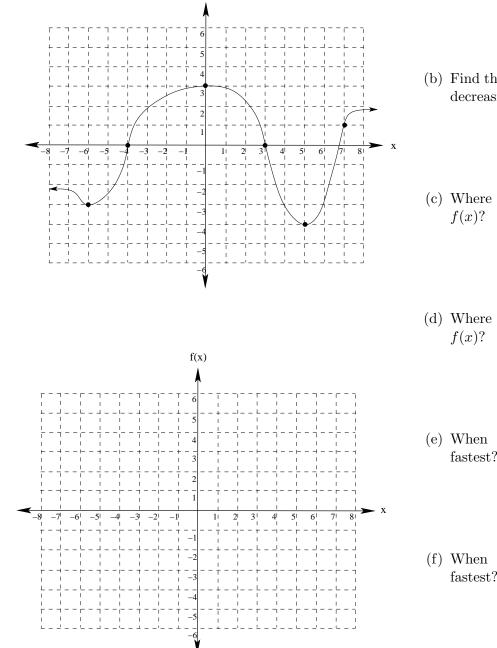
1. Answer the following questions based on the graph of f'(x) shown below:

f '(x)

Find the following:

- (a) Find the intervals on which f(x) is increasing.
- (b) Find the intervals on which f(x) is decreasing.
- (c) Where are the local maxima of f(x)?
- (d) Where are the local minima of f(x)?
- (e) When is f(x) increasing the fastest?
- (f) When is f(x) decreasing the fastest?





2. For each of the following functions, (i) find all critical numbers, (ii) determine where the function is increasing and where it is decreasing, (iii) determine whether each critical number represents a local maximum, local minimum, or neither, and (iv) use this information to sketch the graph of the function.

(a)
$$f(x) = 2x^3 - 9x^2 - 108x + 50$$

(b)
$$g(x) = \frac{x^2}{x-3}$$

3. Sketch a graph of a function f satisfying all of the following properties:

| f(x) | < 2 for all x; f(-3) = f(-1) = 0; f'(x) < 0 for x < -2 and f'(x) > 0 for x > -2; f(-2) is undefined; and $\lim_{x \to -2^-} f(x) > \lim_{x \to -2^+} f(x)$

4. A section of roller coaster is in the shape of $y = -\frac{3}{5}x^5 + 5x^3 - 12x + 70$, where $-3 \le x \le \frac{5}{2}$. Find all local extrema and explain what the corresponding portions of the roller coaster are. Where are the highest and lowest points on this section of roller coaster track? Sketch a graph of this section of the roller coaster. Where do you think the roller coaster is traveling the fastest?