Math 124 Group Worksheet ***(Sec. 3.3 & 3.4)*** **Name**_____

Directions: Work in groups of 2-3. You may need extra paper.

1.

This exercise is designed to illustrate how numerical information from a function and its derivatives can be used to get a very good sense of how the function looks. While it is a good idea to use your graphing calculator to check your final answers, it would be missing the point to use it earlier.

Consider the function

$$f(x) = x^{1/3}(x-4)$$

1. Where are the zeros (roots) of f?

2. Does f' have any points x where $f'(x) = 0$? Where $f'(x)$ is not defined?

3. On what intervals is f increasing? On what intervals is it decreasing?

4. Where are the local maxima and minima of f?

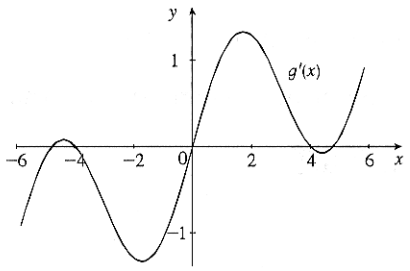
5. Does f'' have any points x where $f''(x) = 0$? Where $f''(x)$ is not defined?

6. Where is f concave up? Where is it concave down?

7. Where are the inflection points of f?

8. Using this information, sketch a graph of $y = f(x)$ on a separate piece of paper.

2 **a.** Consider the graph of g', the derivative of g.

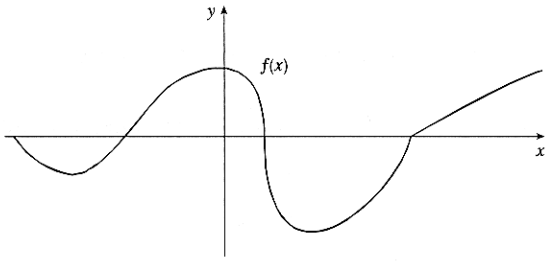


(a) Find and classify the local extrema of g.

(b) Where is g concave up?

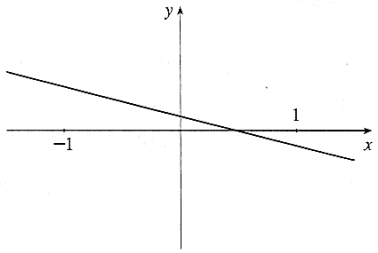
(c) Which is larger, $g\,(2)$ or $g\,(4)$, or is there not enough information to tell?

b. Identify the inflection points for $f\,(x)$ on the following picture:



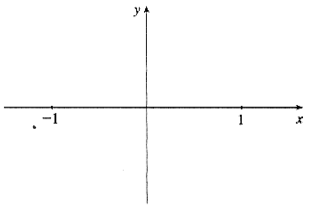
At each inflection point, give possible values for $f''\,(x)$, or explain why it does not exist.

c. Let $f\,(x)$ be a function whose *second* derivative f'' is sketched below.

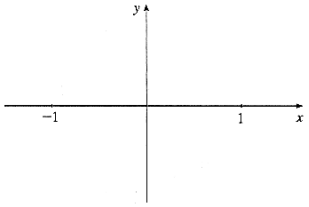


Sketch possible graphs of f such that

(a) f is increasing on $[-1, 1]$.



(b) f has a local minimum at $x = 0$.



(c) f is decreasing on $[-1, 1]$.