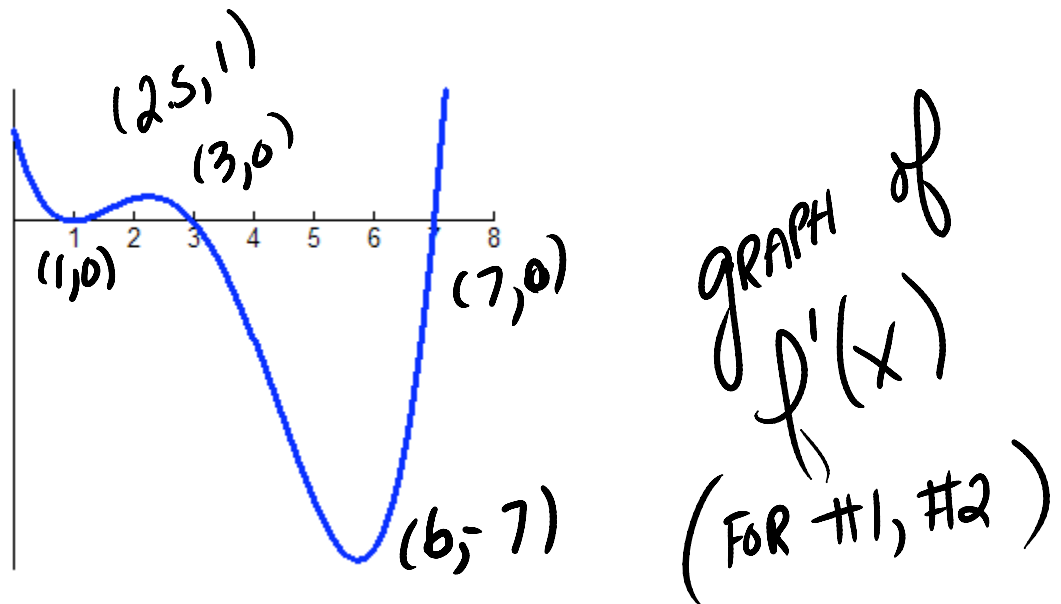


My Chapter 3 Take-Home Project _____

I, _____, claim that all work on this project is my own and that I have received NO help from anyone living, dead, or undead.

[You may consult your own notes and your textbook but may NOT consult with anyone. This includes asking someone, including Ms. McCleary, on how to do a problem.]



1. The graph of the first derivative of a function is shown above. At what values of x does the function, $f(x)$, have relative extrema? Justify completely.

2. At what values of x does the function, $f(x)$, have points of inflection? Justify completely.

3. Let $f(x)$ be the function defined by $f(x) = k + 12x + 3x^2 - 2x^3$, where k is a constant.

(a) On what interval(s) is the function increasing? Justify your answer.

(b) If the relative maximum value of f is 30, then what is the value of k ? [Justify]

(c) Find the interval where the function f is concave up. [Justify]

4. Let f be a twice-differentiable function such that $f(10)=25$ and $f(25)=10$. And, let $g(x)$ be the function given by $g(x)=f(f(x))$.

(a) Explain why [using Calculus] there must be value c , $10 < c < 25$, such that $g'(c)=1$.

(b) Show that $g'(10)=g'(25)$. Use this result to show that there must be a value k , $10 < k < 25$, such that $g''(k)=0$.

The table below gives values of the velocity, $v(t)$, of a **Inferi** [An “inferi” is sort of like a zombie but made by the Dark Lord] at selected times.

t (sec)	0	1	3	6	10	15
$v(t)$ m/sec	5	1	-1	5	10	13

- (a) Is there a time during $0 < t < 15$, that the velocity is equal to 9 m/sec
Justify completely.
- (b) Find an approximation for the acceleration at time $t = 2$ and indicate units. [Show all work]
- (c) Show that there must be a time interval such that the acceleration, $a(t)$, is equal to zero