Homework 2.4 – Analyzing Cubic Functions

1. **(1 pt) alfredLibrary/AUCI/chapter2/lesson4/quiz/cubes1pet.pg**
(a) Factor the difference of cubes:

$x^3 - 125 =$ _____

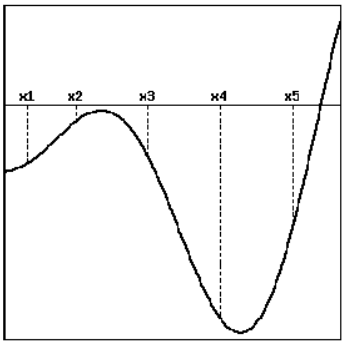
(b) Factor the sum of cubes:

$x^3 + 64 =$ _____

2. **(1 pt) alfredLibrary/AUCI/chapter2/lesson4/quiz/question8pet.pg**
Find all of the zeros (roots, x -intercepts) of the function $f(x) = x^3 + 5x^2 - 6x$. If there is more than one answer, then enter them as a comma separated list. ENTER EXACT ANSWERS, not decimal approximations. If there are no zeros, then enter the word NONE.

$x =$ _____

3. **(1 pt) alfredLibrary/AUCI/chapter2/lesson4/quiz/question6pet.pg**
Given the graph of $y = f(x)$ below, fill in the blanks with the marked x-values at which the given condition is true. For each part, enter your answer as a comma-separated list, e.g., **x1,x3,x5**. Enter the word NONE if no points satisfy the given condition.



(a) $f(x) > 0$ at $x =$ _____.

(b) $f'(x) > 0$ at $x =$ _____.

(c) $f(x)$ is increasing at $x =$ _____.

(d) $f'(x)$ is increasing at $x =$ _____.

(e) The slope of $f(x)$ is negative at $x =$ _____.

(f) The slope of $f'(x)$ is negative at $x =$ _____.

4. **(1 pt) alfredLibrary/AUCI/chapter2/lesson4/concavity1bpet.pg**
Let $f(x) = x^3 - 4x^2 + 6x + 1$.

Perform a number-line sign test for the second derivative to find the x-coordinates of inflection points and the open intervals on which f is concave up or down.

(a) f is concave up on the interval(s) _____.

(b) f is concave down on the interval(s) _____.

(c) The inflection points occur at $x =$ _____.

Notes: In the first two blanks, your answer should either be a single interval, such as (0,1), a comma separated list of intervals, such as (-inf, 2), (3,4), or the word NONE. In the last blank, your answer should be a comma separated list or the word NONE.

5. **(1 pt) alfredLibrary/AUCI/chapter2/lesson4/graphanalysis1pet.pg**
Suppose that $f(x) = x^3 - 9x^2 + 2$.

(a) List all the critical points of f. If there are no critical points, then enter the word NONE:
$x =$ _____

(Now perform a number-line sign test for the derivative function.)

(b) Use **interval notation** to indicate where f is increasing:
_____

(c) Use interval notation to indicate where f is decreasing:
_____

(d) List the x-values of all local maxima of f. If there are no local maxima, then enter the word NONE:
$x =$ _____

(e) List the x-values of all local minima of f. If there are

(Now perform a number-line sign test for the second derivative function.)

(f) Use interval notation to indicate where f is concave up:
_____

(g) Use interval notation to indicate where f is concave down:
_____

(h) Find all inflection points of f. If there are no inflection points, then enter the word NONE:
$x =$ _____

(i) Use all of the preceding information to sketch a graph of f. When you're finished, enter a "1" in the box: ___