

Math 1A: Assignment 3 (23 points)

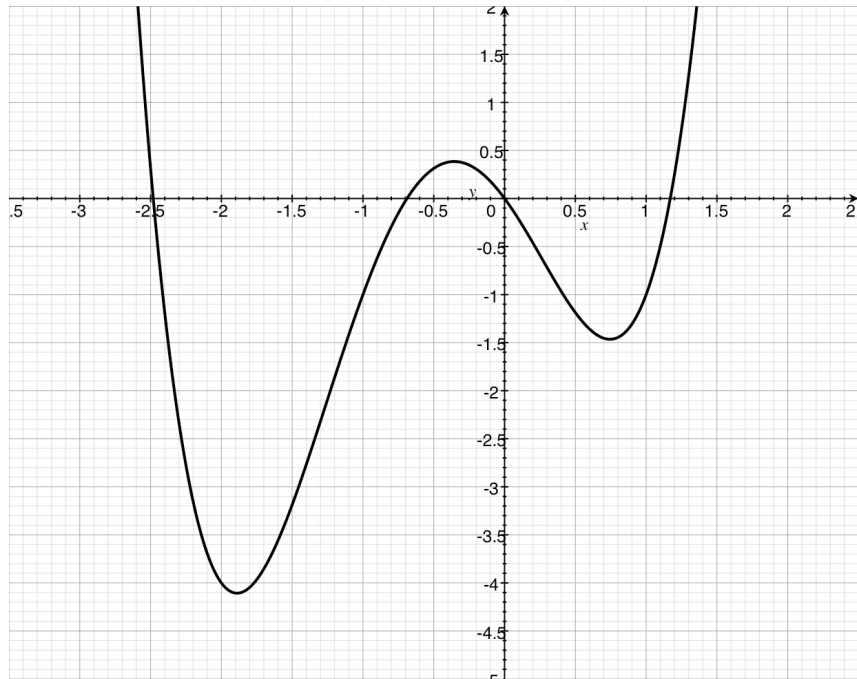
Due by the time you take Exam III – Late Assignments will not be accepted.

There are 2 pages to this assignment

- Do all work on a separate sheet of paper.
- You must show work to receive credit.
- Turn in work in order (#2 should come after #1, etc.)
- You may work in groups of up to 3 people. Points will be taken off, if more than 3 names are on one assignment.

1. (2 points) Suppose $f(x) = x^3 + x^2 - x$. Find the value(s) of x in the interval $(-2, 2)$ that satisfy the Mean Value Theorem.
2. (4 points) Let $f(x) = x^6 + 2x^3 - 5$. Find the following (*do not give decimal answers*).
 - a. All local and absolute extreme values.
 - b. Intervals of increasing/decreasing
 - c. Intervals of concavity.
 - d. All inflection points – the x and y values.
3. (3 points) Sketch one function that satisfies all the following:
 - $f(1) = 0$; $f(3) = 4$
 - $f'(x) > 0$ on $(-\infty, -1), (1, 3), (4, \infty)$
 - $f'(x) < 0$ on $(-1, 1), (3, 4)$
 - $f'(1)$ and $f'(3)$ do not exist
 - $f''(x) > 0$ on $(2, 3), (3, \infty)$
 - $f''(x) < 0$ on $(-\infty, 1), (1, 2)$
4. (4 points) Find the following limits:
 - a. $\lim_{x \rightarrow 1^+} \left(\frac{1}{x-1}\right)^{\ln x}$
 - b. $\lim_{x \rightarrow \infty} e^x - x$
5. (3 points) Find A so that $\lim_{x \rightarrow +\infty} \left(\frac{x+A}{x-2A}\right)^x = 5$
6. (3 points) A page of a book is to contain a rectangle of printed matter that an area of 30 square inches. If the page is to have a 1-inch margin on the sides and a 2-inch margin at the top and bottom, find the dimensions of the smallest page.
7. (3 points) A company uses packages to send its product. All of their boxes have bases that are equilateral triangles. If a box uses 24 square feet of material, what is the maximum volume the box can hold?

8. (4 points) The graph of the *derivative of a function* is shown below. Estimate answers to the nearest 10^{th} .



- On what intervals is the function increasing and decreasing?
- What are the x-values of all local max/min values?
- On what intervals is the function concave up/down?
- What are the x-values of all inflection points?