Name: _____

- Write all of your responses on these exam pages. If you need more space for your answers please use the backs of the exam pages.
- Make sure that you show all of your work, answers without supporting work will receive no credit.
- **No calculation devices are to be used on this exam.**

1. (*50 Points*) For the following function

$$f(x) = \frac{x^2 - x}{2 - x}$$

(a) Find the domain of the function.

(b) Find the x and y intercepts of the function.

(c) Test for even/odd symmetry.

(d) Find the vertical, horizontal, and tilted asymptotes.

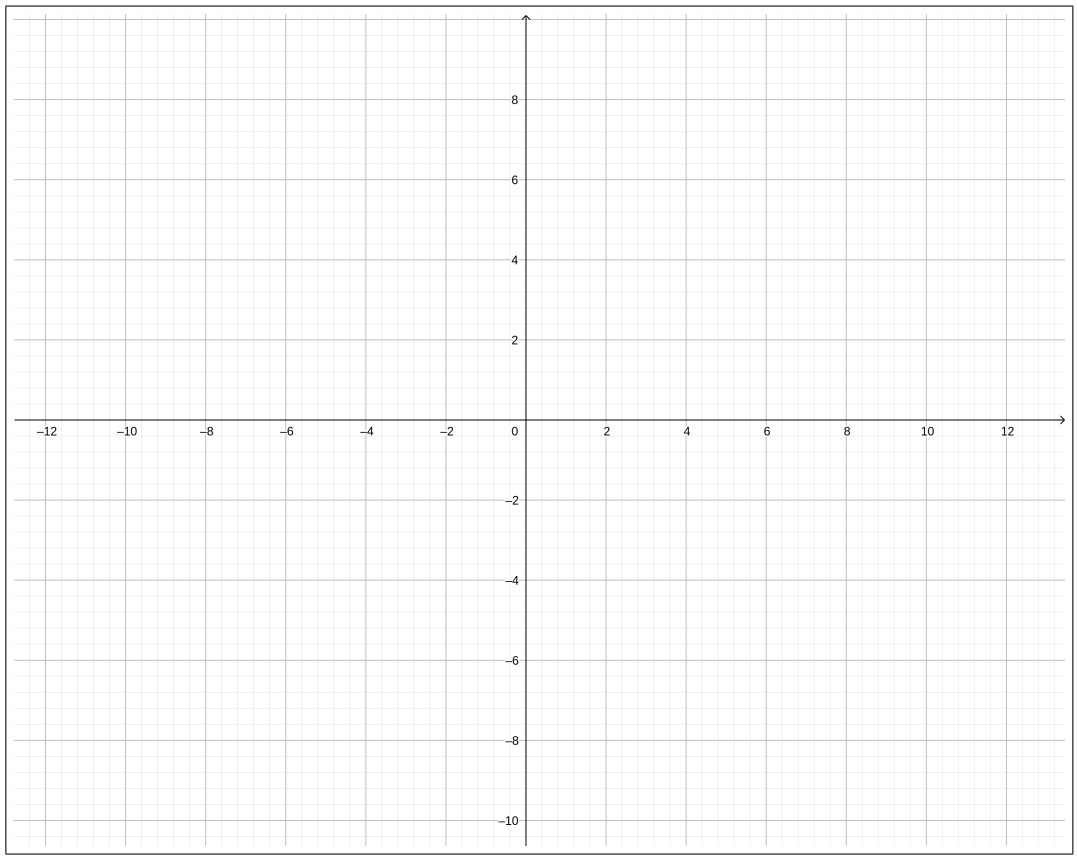
(e) Find the intervals of increase or decrease.

(f) Find the local maximum and minimum values.

(g) Find the intervals of concave up or concave down.

(h) Find the inflection points.

(i) Make a sketch of the graph given the information about the properties of the function.



2. (*15 Points*) Find the absolute maximum and minimum of

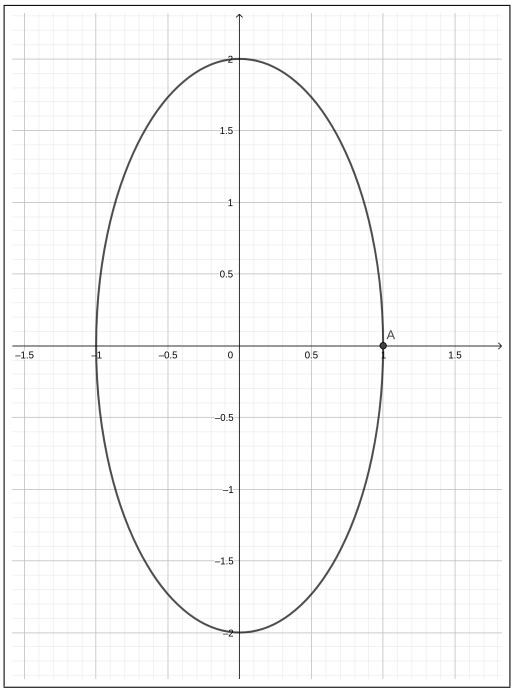
$$f(x) = x^3 - 6x^2 + 5$$

on the interval $[-3, 5]$. Keep your answers in exact form.

3. (*15 Points*) Find the following limit,

$$\lim_{x \to -\infty} x \ln\left(1 - \frac{1}{x}\right)$$

4. (*20 Points*) Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point $(1, 0)$. Keep your answers in exact form.



5. **Extra Credit** (*10 Points*): A steel pipe is being carried down a hallway that is 9 ft wide. At the end of the hall there is a right-angled turn into a narrower hallway, 6 ft wide. What is the length of the longest pipe that can be carried horizontally around the corner? Keep your answers in exact form.