Last Name: _____.

First Name: _____.

Mathematics 1a
Midterm # 2
April 8, 1998.

Your section (choose one):

Otto Bretscher	Bing Cheng	Greg Warrington
MWF 11–12	TΘ 10–11:30	MWF 10–11

Question	Score
1	
2	
3	
4	
5	
Total	

Calculators are not allowed.
No justification is necessary for question 1.
Write your answers in the spaces provided.
Each question on this exam is worth 10 points.
In questions 2, 3, 4 and 5, unsubstantiated answers cannot be given credit.
Good luck.

1. (10 points). True or false, no explanation necessary.

a) **T** **F**

If $(c, f(c))$ is a critical point of the function f, then f necessarily has a local extremum at c.

b) **T** **F**

$$\lim_{x \to 0} \frac{\sqrt{4+x} - 2}{x} = \frac{1}{4}$$

c) **T** **F**

$$e^{\log_2(x)} = x^{1/\ln(2)}$$

d) **T** **F**

If $f'(-3) = 4$ and $f(x)$ is always concave up, then $\lim_{x \to \infty} f(x) = \infty$.

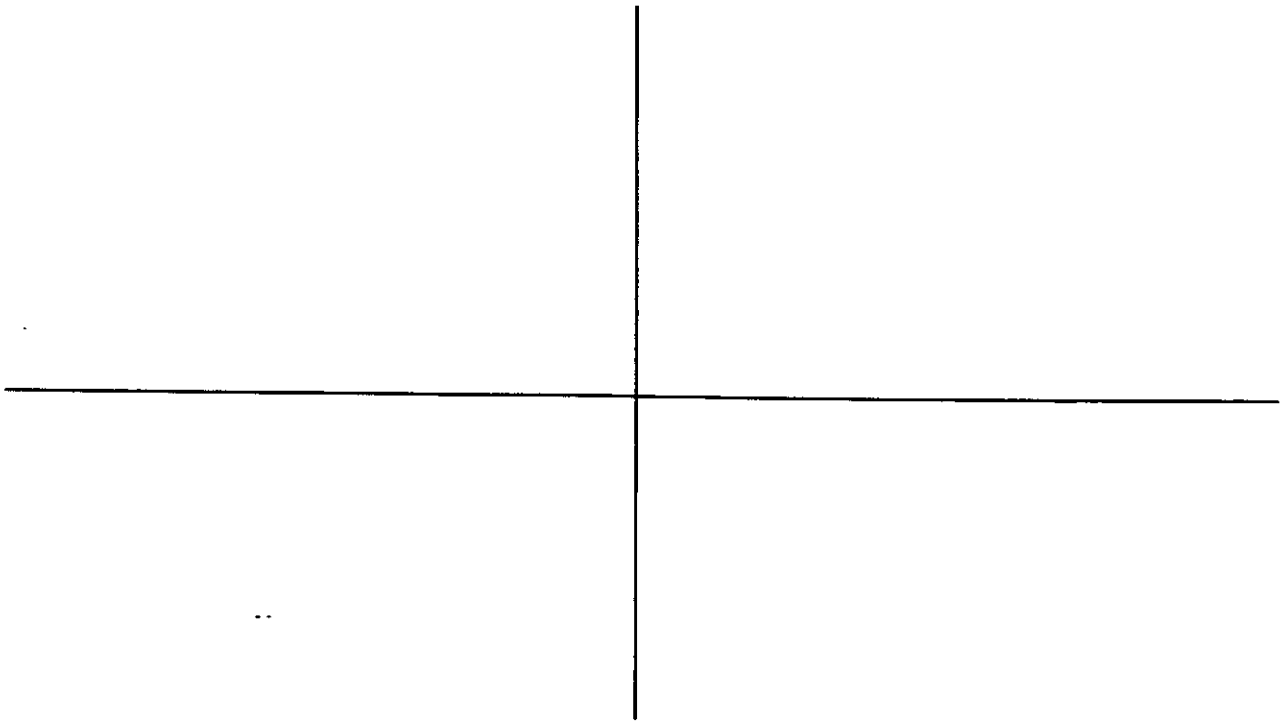
e) **T** **F**

$$f(x) = \frac{1 - 9x^2}{3 - 4x + 5x^2} \qquad \text{has a horizontal asymptote at } y = 1/3.$$

2. (10 points). A girl is flying a kite at a constant height of 300 ft. When the girl has let out 500 ft. of string, the wind is moving the kite horizontally at 25 ft./sec. How fast must she let out the kite string at this time?

3. (10 points).

a) Graph the function $y = (x-1)/x^2$ in the space provided. Make sure to label carefully all occurrences of relative extrema, inflection points, x and y-intercepts, and asymptotes.



b) How many solutions does the equation $(x-1)/x^2 = k$ have for an arbitrary constant k? (You may have to distinguish several cases.)

4. (10 points). A bottle of sparkling cider is put in the snow (at 0° Celsius) to chill in anticipation of the end of classes. The bottle is initially at 30° Celsius. If its temperature drops at an instantaneous rate of 3% per minute, how long must our revelers wait until the bottle is at 5° Celsius? You may use the following table of values to help you in your answer.

x	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10
$\ln x$	−0.69	−1.10	−1.39	−1.61	−1.79	−1.95	−2.08	−2.20	−2.30

5. (10 points). A farmer wishes to build an E-shaped fence (see picture) along a straight river bank so as to create two identical rectangular pastures. With 300 feet of fencing material, what is the largest area he can enclose?