

Your Name

Your Signature

Student ID #

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(circle one) BA BB BC

Problem	Total Points	Score
1	12	
2	11	
3	14	
4	9	
5	4	
Total	50	

- This exam is closed book. You may use one side of an $8\frac{1}{2} \times 11$ sheet of handwritten notes.
- Do not share notes.
- Scientific calculators may be used. But symbolic or graphing calculators are not allowed.
- In order to receive credit, you must show and explain your work. Do not do computations in your head. Instead, write them out on the exam paper.
- Place a box around **YOUR FINAL ANSWER** to each question.
- If you use a trial and error (or guess and check) method when an algebraic method is available, you will not receive full credit.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so.
- Raise your hand if you have a question.

1 (12 points) Compute the following limits, if they exist. Show your work. If a limit doesn't exist, make sure you give a reason.

(a) (4 points) $\lim_{x \rightarrow 3} \frac{4x - 3}{3x - 9}$

(b) (4 points) $\lim_{x \rightarrow 0} \frac{1 - \sqrt{x^2 + 1}}{x^2 - 3x}$

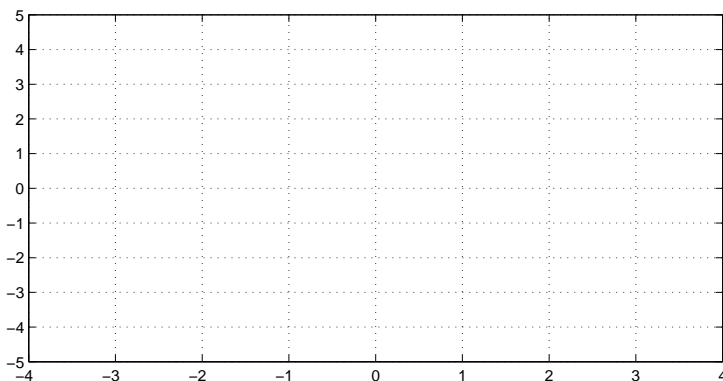
(c) (4 points) $\lim_{x \rightarrow \infty} \left(\frac{x^2}{x - 2} - \frac{x^2}{x - 3} \right)$

2 (11 points) Look at the function below:

$$F(x) = \begin{cases} \frac{x-1}{x+1} & \text{if } x < 0; \\ \frac{1}{5} + (x-2) & \text{if } 0 \leq x < 2; \\ \frac{1}{1+x^2} & \text{if } 2 \leq x. \end{cases}$$

- (a) (6 points) Where does F fail to be continuous? Look for three suspicious points. **Check each** and give a reason why F is or is not continuous there.

- (b) (5 points) F has two horizontal and one vertical asymptote. Write an equation for each asymptote and include them in a very rough sketch of F .



- 3 (14 points) Suppose that the distance between a paper airplane and the launcher t seconds after it is launched is given by the formula $d(t) = 10 - \frac{10}{1+t}$.
- (a) (10 points) Calculate the instantaneous velocity at $t = 1$ by computing the limit of the slopes of secants. **Don't just use a formula from calculus.**

- (b) (4 points) Find the inverse function of $d(t)$ i.e. $T(d)$ should represent the time it takes to reach a distance d from the launcher.

4 (9 points) Isobel invests some money in shares of stock in the Hartford Steam Boiler Company. This price is going down when she buys the stock. After four weeks it reaches a minimum price of \$37 a share and then turns around. It starts going up. It reaches a maximum price of \$71 a share 10 weeks after she bought the stock and then starts going down again.

(a) (6 points) Find a sinusoidal function modelling the price of a share of HSB stock as a function of time in weeks after Isobel made her purchase.

(b) (3 points) What price does the model predict for the stock 18 weeks after Isobel's purchase?

5 (4 points) What is the maximum value of each of the functions below:

(a) $3 + 4 \sin(2t - \pi)$

(b) $4 - (x + 2)^2$