Midterm 1 practice 3

UCLA: Math 3B, Winter 2019

Instructor: Noah White
Date:

- This exam has 3 questions, for a total of 36 points.
- Please print your working and answers neatly.
- Write your solutions in the space provided showing working.
- Indicate your final answer clearly.
- You may write on the reverse of a page or on the blank pages found at the back of the booklet however these will not be graded unless very clearly indicated.
- Non programmable and non graphing calculators are allowed.

Name: _____

ID number: _____

Discussion section (please circle):

Day/TA	Louis	Matthew
Tuesday	1A	1C
Thursday	1B	1D

Question	Points	Score
1	12	
2	12	
3	12	
Total:	36	

Question 1 is multiple choice. Once you are satisfied with your solutions, indicate your answers by marking the corresponding box in the table below.

Please note! The following three pages will not be graded. You must indicate your answers here for them to be graded!

Question 1.

Part	A	B	C	D
(a)				
(b)				
(c)				
(d)				
(e)				

1. Each of the following questions has exactly one correct answer. Choose from the four options presented in each case. No partial points will be given.

   (a) (2 points) The function $f(x) = \frac{1}{1+x^2}$ has

   A. a vertical asymptote at $x = -1$.

   B. a horizontal asymptote at $y = 0$.

   C. no asymptotes.

   D. a slanted asymptote.

   (b) (2 points) The function $g(x) = x - \sin x$ has a critical point at

   A. $x = \pi/2$.

   B. $x = 2$.

   C. $x = \pi$.

   D. $x = 0$.

   (c) (2 points) The function $f(x) = \frac{1}{5-4x+x^2}$ has a

   A. local minimum at $x = 2$.

   B. local maximum at $x = 2$.

   C. local minimum at $x = 1$.

   D. local maximum at $x = 1$.

(d) (2 points) An antiderivative of $h(t) = 2e^{2x} - 4x$ is given by

A. $2x^2 - \cos x^2$

B. $2x^2 - 2e^{2x}$

C. $e^{2x} - 2x^2 + \frac{5}{11}$

D. $4e^{2x} - 4$

(e) (2 points) The area $\int_2^3 \ln x \, \mathrm{d}x$ can be expressed as the limit as $n \to \infty$ of

A. $\sum_{k=1}^{n} \ln\left(2 + \frac{k}{n}\right)$

B. $\sum_{k=1}^{n} \frac{2}{n} + \frac{k}{n^2}$

C. $\frac{1}{n} \sum_{k=1}^{n} [\ln(2n + k) - \ln n]$

D. $\sum_{k=1}^{n} \frac{k}{n^2}$

(f) (2 points) Evalute the definite integral $\int_0^{\pi} \cos(x - \frac{\pi}{2}) \, \mathrm{d}x$

A. 1

B. 2

C. π

D. 0

2. Let $f(x) = \frac{1}{1+e^{2x}}$. Note that $f'(x) = \frac{-2e^{2x}}{(1+e^{2x})^2}$ and $f''(x) = \frac{-4e^{2x}(1-e^{2x})}{(1+e^{2x})^3}$.

   (a) (2 points) Find the x and y intercepts of $f(x)$.

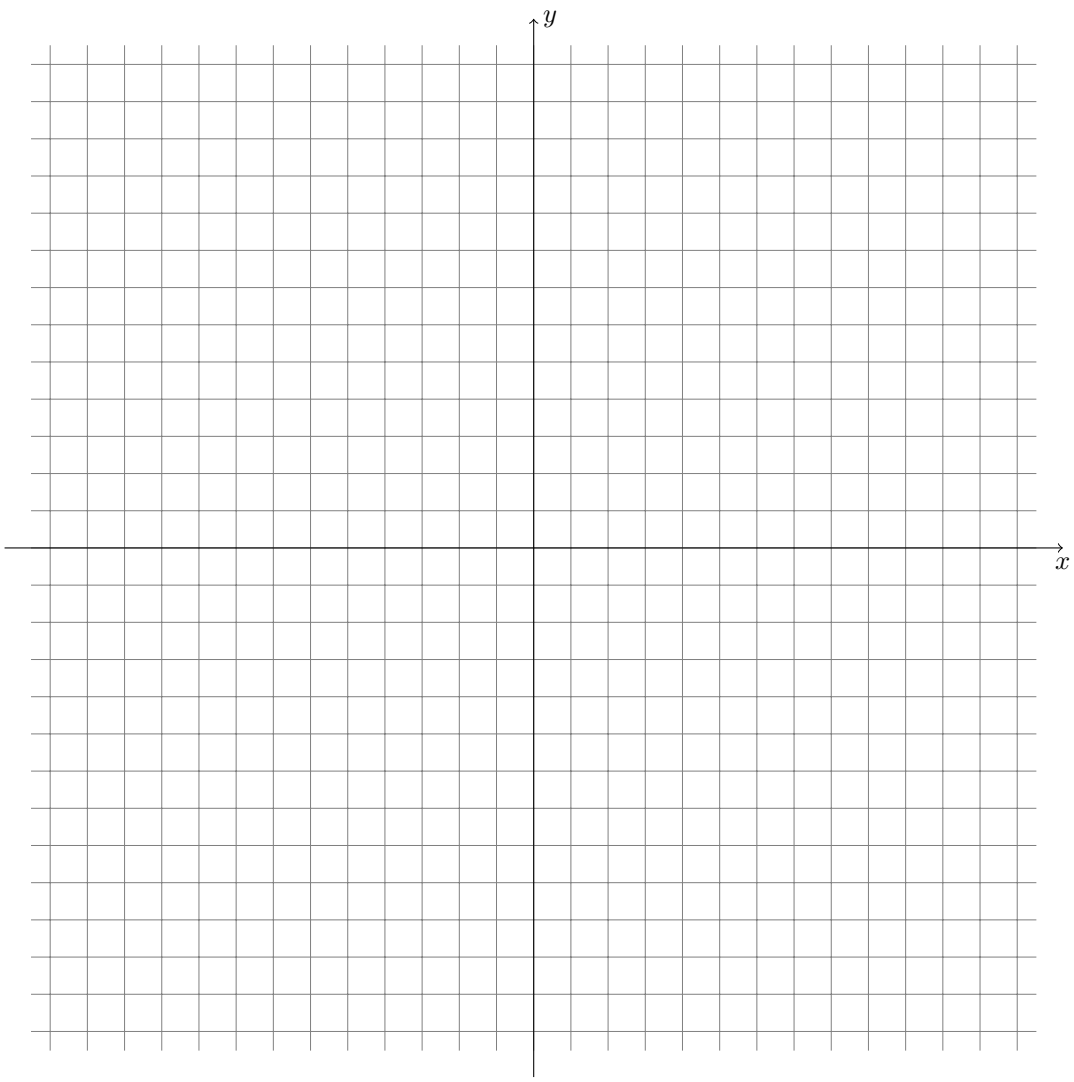
   (b) (2 points) Does $f(x)$ have any horizontal asymptotes? If so what are they?

   (c) (1 point) Does $f(x)$ have any vertical asymptotes? If so what are they?

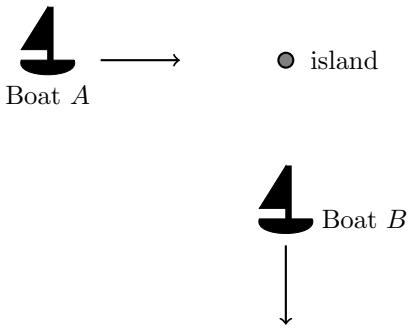
   (d) (2 points) For what x is the first derivative $f'(x)$ positive?

(e) (2 points) For what x is the second derivative $f''(x)$ positive?

(f) (3 points) On the graph provided, sketch $f(x)$



3. Two boats are travelling to and from an island in straight lines, as indicated below. Boat A is heading due east at a constant speed of 1 m/h and at time $t = 0$ is 3 miles from the island. Boat B is heading due south at 2 m/h and at time $t = 0$ is at the island. Both boats stop travelling after boat A reaches the island.



(a) (5 points) Write down an expression for the distance $s(t)$ between the boats after t hours have elapsed.

(b) (2 points) What is a sensible domain for $s(t)$?

(c) (5 points) At what point in time, are the boats closest together?

This page has been left intentionally blank. You may use it as scratch paper. It will not be graded unless indicated very clearly here and next to the relevant question.

This page has been left intentionally blank. You may use it as scratch paper. It will not be graded unless indicated very clearly here and next to the relevant question.