

161s07	Final	Exam Time: Monday 5/7, 4:00 - 7:00
Name:	Student No.:	

Instructions:

- Answer ALL questions from Section A
- You may use a handwritten sheet of notes. Calculators are NOT permitted.
- Read all questions carefully
- Unless explicitly told otherwise, you should explain all your answers fully.
- Do NOT separate the pages of your exam.

Problem	Points	Score
A1	12	<input type="text"/>
A2	16	<input type="text"/>
A3	10	<input type="text"/>
A4	4	<input type="text"/>
A5	10	<input type="text"/>
A6	10	<input type="text"/>
A7	10	<input type="text"/>
A8	8	<input type="text"/>
A9	10	<input type="text"/>
A10	10	<input type="text"/>
Total	100	<input type="text"/>

Name:

Section A: Answer ALL questions.

Problem A1: [12 pts] In each case, find $\frac{dy}{dx}$. Put your final answers in the box provided.

(a) $y = \frac{e^{x^2}}{1+x^2}$

$$\frac{dy}{dx} =$$

(b) $y = \frac{x^{3x}}{1+x}$

$$\frac{dy}{dx} =$$

(c) $e^{xy^2} = 4x$

$$\frac{dy}{dx} =$$

Name:

Problem A2: [16 pts] Find the following integrals.

(a) $\int \frac{3}{1+x^2} - \frac{1}{x^2} dx$

ANS:

(b) $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

ANS:

(c) $\int_1^2 x^3 - e^x dx$

ANS:

(d) $\int_0^{\pi/4} \cos(2x) \sin^5(2x) dx$

ANS:

Name:

Problem A3: [10 pts] Find the following limits:

(a) $\lim_{x \rightarrow \infty} \frac{\sqrt{3x^6 + 2x + 1}}{x^3 + 2}$

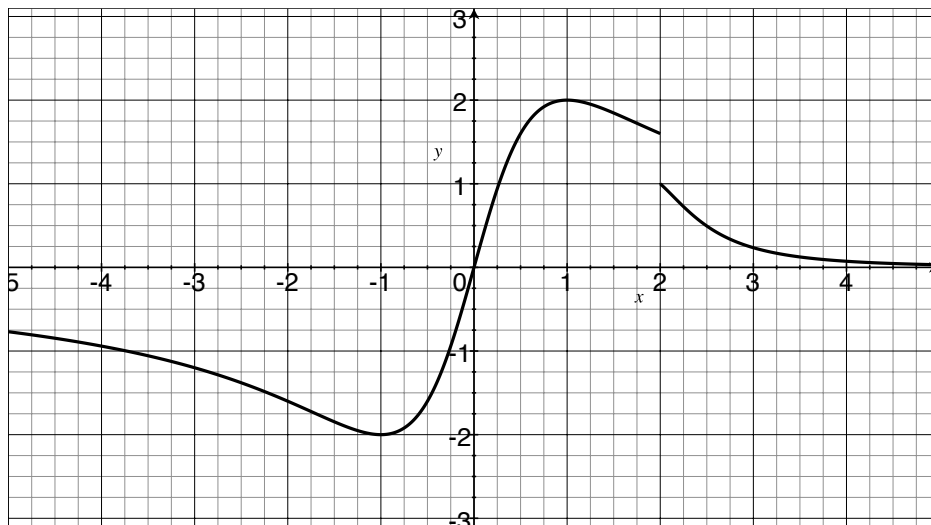
ANS:

(b) $\lim_{x \rightarrow 0} (\ln x \tan x)$

ANS:

Name:

Problem A4: [4 pts] The graph of $y = f(x)$ is shown below.



(a) What are the critical values of $f(x)$?

(b) Put the following x -values in order of increasing values of $f'(x)$. $x = -2, \frac{1}{2}, 4$.

(c) At which of the following values is $f''(x)$ positive? $x = -3, -1, 1, 4$.

(d) Is $\int_{-1}^2 f(x)dx$ positive or negative?

Name:

Problem A5: [10 pts] Ben is flying a kite on the end of a string. The wind blows the kite horizontally at 5 m/s and the height of the kite is constant. When the string is 50 m long, he is letting it out at a rate of 4 m/s . How high is the kite? Give your final solution in the box provided.

Height=

Name:

Problem A6: [10 pts] A raindrop condenses out of a stationary cloud at height 200 m . After it begins to fall, it changes shape in such a way that its acceleration in m/s^2 is given by

$$a(t) = \begin{cases} -10 + 2t, & t \leq 5 \\ 0, & t > 5 \end{cases}$$

When does it hit the ground? Give your answer in the box provided.

It hits after

Name:

Problem A7: [10 pts] What are the dimensions of the rectangle of greatest area which can be inscribed in a circle of radius 2.

Height =

Width =

Area =

Name:

Problem A8: [8 pts] A car has velocity $v(t) = 1 - \sqrt{t}$, $t > 0$

(a) Find the net change in position over the interval $0 \leq t \leq 4$.

Net Change =

(b) Find the total distance traveled over the interval $0 \leq t \leq 4$.

Distance =

Name:

Problem A9: [10 pts] Consider the function $f(x) = 2x^3 - 9x^2 - 24x + 3$

(a) Find and classify all the critical points of $f(x)$. Put your answers in the table (you may not need all the entries).

Critical Point:					
Type:					

(b) Find the absolute maximum and absolute minimum values that $f(x)$ takes on the interval $[-2, 2]$ and where they occur.

	Abs. Max	Abs. Min
$x =$		
$f(x) =$		

(c) On what interval(s) is $f(x)$ concave up? Give your answer in interval notation.

Concave up on

Name:

Problem A10: [10 pts] The volume of a hemisphere of radius r is

$$V = \frac{2}{3}\pi r^3$$

Use linear approximation to estimate the volume of paint required to put a 2 *mm* coat of paint on a hemispherical dome of radius 10 *m*. Give your answer in liters. (Recall 1 *liter* = 1000 *cm*³ = 0.001 *m*³).

NO CREDIT WILL BE GIVEN TO SOLUTIONS THAT ARE NOT BASED ON LINEAR APPROXIMATION.

Volume=