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 Name
 

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 Living Group
 

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 4-DIGIT I.D.
 

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Scores	
1.	/10
2.	/10
3.	/15
4.	/10
5.	/15
6.	/10
7.	/15
8.	/15

## Circle Recitation

1. Deblassie (TR9)
2. Jerison (TR11)
3. Mazzeo (TR12)
4. Malkus (MW1)
5. Ajtai #1 (MW2)
6. Kalai (TR10)
7. Morgan (TR11)
8. Richman (MW11)
9. Ajtai #2 (MW3)
10. Alon (TR12)

Check that you have all 4 pages. Put your name on each page. List above any 4-digit I.D. you will be able to remember, such as the last 4 digits of your MIT I.D. Circle your recitation. Put your work and answers on this test. Circle answers. The value of each problem is indicated in parenthesis, 100 points total. Work and neatness count. In general, wrong answers receive no partial credit. Solutions posted by 2 p.m. outside 2-108. Scores posted by 4-digit I.D. by 8:00 p.m. tonight outside 2-108. Calculators not permitted. Use good judgment in simplifying answers. Good luck.

- (10) 1. What is the derivative of the function  $f$  given by

$$f(x) = \sin(3x^2 - 7x + 9)?$$

- (10) 2. Find the slope of the line tangent to the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

at the point  $(3a/5, 4b/5)$ .

ANSWER KEY

Name \_\_\_\_\_

Living Group \_\_\_\_\_

4-DIGIT I.D. \_\_\_\_\_

Scores	
1.	/10
2.	/10
3.	/15
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- (10) 1. What is the derivative of the function
- $f$
- given by

$$f(x) = \sin(3x^2 - 7x + 9)?$$

$$f'(x) = (6x - 7) \cos(3x^2 - 7x + 9)$$

[5 pts for  $\cos$  and chain rule]

- (10) 2. Find the slope of the line tangent to the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

at the point  $(3a/5, 4b/5)$ .

BY IMPLICIT DIFFERENTIATION,

$$\frac{2x}{a^2} + \frac{2y}{b^2} \frac{dy}{dx} = 0;$$

At  $(3a/5, 4b/5)$

$$\frac{dy}{dx} = -\frac{x}{y} \frac{b^2}{a^2}$$

$$\frac{dy}{dx} = -\frac{3a}{4b} \frac{b^2}{a^2} = -\frac{3b}{4a}$$

[5 pts for basically correct imp. diff]

**ANSWER KEY**

Name \_\_\_\_\_

4-Digit ID \_\_\_\_\_

Rec. Instructor \_\_\_\_\_

Rec. Time \_\_\_\_\_

Put your work and answers on this test. Circle answers.  
 There are 10 problems, each worth 10 points, for 100 points total. The last 2 problems are harder and require you to bring together different concepts you have learned.  
 Work at your best!

1. Compute  $\int_4^6 \frac{dx}{x^2 + 2x - 8}$ .

Use partial fractions.

$$\frac{1}{x^2 + 2x - 8} = \frac{1}{(x-2)(x+4)} = \frac{1/6}{x-2} - \frac{1/6}{x+4}$$

by "coverup method"

Hence  $\int_4^6 \frac{dx}{x^2 + 2x - 8} = \frac{1}{6} \ln|x-2| \Big|_4^6 - \frac{1}{6} \ln|x+4| \Big|_4^6$

$$= \frac{1}{6} (\ln 4 - \ln 2 - \ln 10 + \ln 8) = \frac{1}{6} \ln \frac{8}{5}$$

Scores

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Total

2. Does the following series converge? GIVE A REASON.

$$\sum_{n=1}^{\infty} \frac{1}{n^2(2 + \ln n)(n^2 + 6)}$$

Yes, by comparison with  $\sum \frac{1}{n^2}$ .

SEE PROF. FRANK MORGAN  
ON TELEVISION:

EVENING MAGAZINE

→ WED. MAY 30 7:30PM