

Collaborative Activity vs. Voluntary Activity

Two Math 121 (Calculus I) Sections, Spring 2007

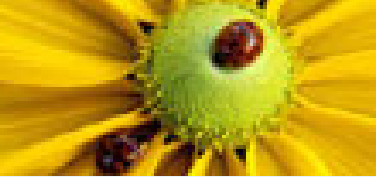
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Capstone Project for CETL Teaching Certificate

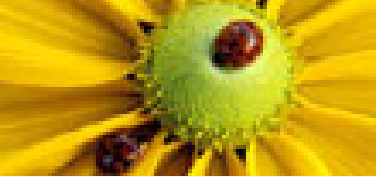


Outline

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- Class Information
- Exam 4
- Activities for problems 3 and 4
- Observations: Section 04
- Observations: Section 06
- Exam Results
- Conclusions

1. Class Information
2. Exam 4 (Section 04-April 24; Section 06-April 23)
3. Activities (Section 04-April 18-20; Section 06-April 19, 20)
4. Observations
5. Exam Results
6. Conclusions



Class Information

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- **Class Information**
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	Math 121-04	Math 121-06
Hours	11am TWHF	1pm MTHF
Classroom	TS S352	WH 288A
Shape	almost square	wide and short rectangle
equipment	small blackboard	wide whiteboard

- Textbook: Calculus, one and several variables, 9th Edition by Salas, Hille and Etgen
- New material is introduced to Section 06 first on Monday and Tuesday.
- On Thursday and Friday, Section 04 learns new material first.

	Math 121-04	Math 121-06
# enrolled students	36	36
Freshman	11 (30.6%)	20 (55.6%)
Sophomore	10 (27.8%)	6 (16.7%)
Junior	7 (19.4%)	7 (19.4%)
Senior	2 (5.6%)	2 (5.6%)
Special	4 (11.1%)	1 (2.8%)
Prev degree	2 (5.6%)	0 (0%)
# withdrawn students*	5	5
Freshman	0	2
Sophomore	3	1
Junior	1	2
Senior	0	0
Special	1	0
Prev degree	0	0

* Majors: (Freshman) Comp. and Inf., Elem. Edu.; (Sophomore) Biology, Pre-Major, Comp. and Inf., None listed; (Junior) Pre-Major, Physics, Psychology; (Special) None listed

Major	Math 121-04	Math 121-06
Automotive E	7	6
Comp. and Info	5	4
Biology	2	1
Pre-Mechanic	1	2
Manufacturing	1	1
Pre-Major	1	1
None listed	3	1
Math Teach	4	0
Finance	4	0
Mathematics	1	0
Pre-Civ Eng	1	0
Pre-Nursing	1	0
Management	0	4
Undecided	0	3
Chemistry	0	2
Chemi. Teaching	0	1
Pre-Electric	0	1
ESCI	0	1
Pre-Set	0	1
English	0	1
Pre-Medicine	0	1
Total	31	31



Exam 4

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- Exam 4 covered
 - ◆ Section 4.7: Vertical and horizontal asymptotes
 - ◆ Section 4.8: Some curve sketching
 - ◆ Chapter 5 (9 sections): Integrations

1. [20 pt.s] Let $f(x) = \frac{2x^2}{x^2 + 2x - 3}$.

- (a) Find the domain of f .
- (b) Find the vertical asymptote(s).
- (c) Find the horizontal asymptote(s).
- (d) Find local maximum and minimum, if any.

2. [15 pt.s] Estimate the area under the graph of $f(x) = (x+1)^2 + 1$ from $x = 0$ to $x = 4$ using four rectangles with the same base, and right endpoints. Find also the exact area of the region.

3. [20 pt.s] Evaluate the integrals.

(a) $\int_0^{\pi/4} 3 \cos 2x \, dx$

(b) $\int_0^1 (\sin^2 x + \cos^2 x + x) \, dx$

(c) $\int_{-1}^1 (x^3 - x + \cos x \sin x) \, dx$

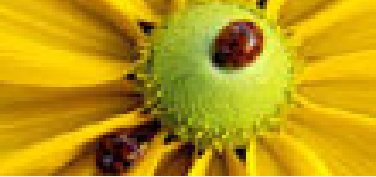
(d) $\int_0^1 (x+2)(x^2 + 4x - 1)^{100} \, dx$

4. [20 pt.s] An object moves along a horizontal line with acceleration $a(t) = 2t - 5$ feet per second per second. Its initial position (position at $t = 0$) is 3 feet to the left of the origin, and its initial velocity (velocity at $t = 0$) is 4 feet per second to the right of the origin.

- (a) Find the position of the object at time $t = 2$.
- (b) Find the distance traveled from time $t = 0$ to $t = 3$.

5. [20 pt.s] Let $P(x, y)$ be an arbitrary point on the line $y = x^{3/2}$. Express the distance from the origin to point $P(x, y)$ and calculate the average of this distance as x ranges from 0 to 2.

6. [5 pt.s] For $a < b$, suppose that f is continuous on $[a, b]$ and $\int_a^b f(x)dx = 0$. Show that there is at least one number c in (a, b) such that $f(c) = 0$.



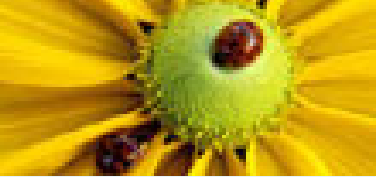
Activities for problems 3 and 4

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Section 04	Section 06
Group work	Voluntary presentation*
Peer discussion among 3-5 students	Individual study
Instructor's help available	Textbook and notes
Three class hours	Two class hours
Entire class	11 students
No extra credit	5 points extra credit

*: The instructor explained students' work on the board.

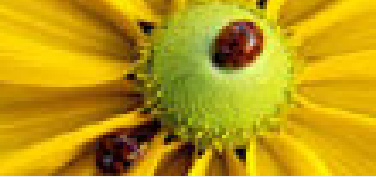
- In both classes, for the last 20 minutes of the last day of activity, the instructor showed how to do problems similar to numbers 2 and 5. The solution of a problem similar to number 1 was posted on D2L.



Observations: Section 04

- The group discussion was very active on the first day. Students worked individually first and compared their answers with other students' in their group. When there were different opinions over problems, they asked the instructor about the specifics of problems, for example, "I think I made a mistake here. What did I do wrong?".

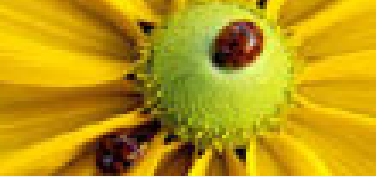
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Observations: Section 04

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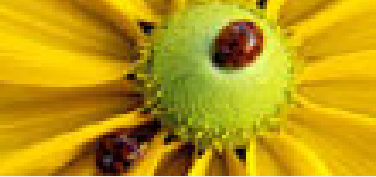
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- On the third day, it was observed that some students were just chatting to each other. Students had less discussion and more tendency to seek a direct help from the instructor. The questions became less specific than the first day, for example, "Could you show me how to do this problem?".



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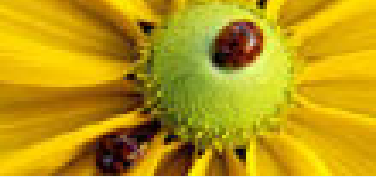
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- It was interesting to see that 80 % of the groups with at least one female student had a female group leader.



Observations: Section 06

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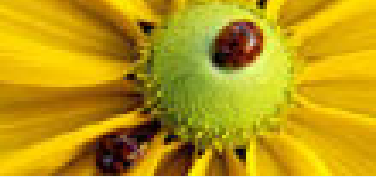
- On the first day, the instructor had to encourage students several times to show their work on the board.



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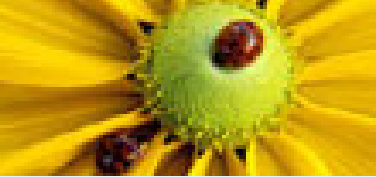
- On the first day, the instructor had to encourage students several times to show their work on the board.
- On the second day, there were more volunteers and it seemed like students were well prepared for their voluntary work.



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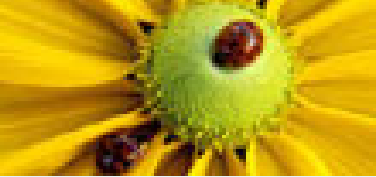
- On the first day, the instructor had to encourage students several times to show their work on the board.
- On the second day, there were more volunteers and it seemed like students were well prepared for their voluntary work.
- Students who did not participate in the voluntary work were taking notes as they did for regular lectures.



Exam Results

- The average of Exam 4 for Section 06 (voluntary board work) is 5 points higher than that for Section 04 (group discussion).

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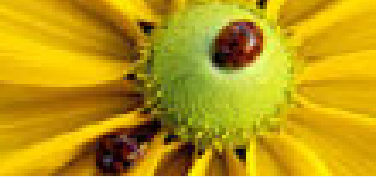
Remark.

	Section 04	Section 06
Exam 1	0	+9
Exam 2	0	+2
Exam 3	0	+1.5
Ave	0	+4.17

Previous three exams

	Section 04	Section 06
Exam 4	0	+5

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- However, the situation—Section 06 with higher average on the Exam 4 also had higher averages for the previous three tests –might suggest that Section 06 has a stronger student body as a whole.



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- However, the situation—Section 06 with higher average on the Exam 4 also had higher averages for the previous three tests –might suggest that Section 06 has a stronger student body as a whole.

Remark. Eight students out of eleven students (Freshman:7, Sophomore: 2, Junior: 1, Senior: 1) who volunteered a board work scored higher on Exam 4 than the average of the entire class. The average of those eleven students is 6 points higher than that of the entire class.