Middlebury College

# Multivariable Calculus: Spring 2018

Homework

**Due February 19, 4pm**

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**Some thoughts and advice:**

- You should expect to spend at least $1-2$ hours on problem sets. A lot of practice problem-solving is essential to understand the material and skills covered in class. Be organised and do not leave problem sets until the last-minute. Instead, get a good start on the problems as soon as possible.
- When approaching a problem think about the following: *do you understand the words used to state the problem? what is the problem asking you to do? can you restate the problem in your own words? have you seen a similar problem worked out in class? is there a similar problem worked out in the textbook? what results/skills did you see in class that might be related to the problem?*

  If you are stuck for inspiration, use the course `piazza` forum (accessible via the course Canvas site). However, don't just ask for the solution - provide your thought process, the difficulties you are having, and ask a coherent question in complete English sentences. Remember the 3RA approach to asking questions outlined in the course syllabus.
- Form study groups - get together and work through problem sets together. **This will make your life easier!** However, you must write your solutions *on your own* and *in your own words*.
- The problems in parentheses are for extra practice and optional (in particular, they do not need to be submitted). **Problems for submission are underlined**.

  To gain mastery of a topic you should expect to attempt a significant proportion of the problems in the textbook ($>60\%$(!)).
- Answers to odd-numbered exercises are at the back of the textbook. However, you need to submit a worked solution and provide justification for how you determined the answer.

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- **Read/recap:** §1.2, 1.4
- **Problems:** §$X.y$ refers to Chaper $X$, Section $y$ of *Vector Calculus*, by Colley (4th Edition). All problems are taken from the 4th Edition.

  §1.2: 46
  §1.4: (5), 6, (10), 11, 12, 17, 19, (22), 24, 25, (26)

  In addition to the problems from the textbook, submit solutions to the following:

  **Problem A:** Use the cross product to determine whether the points $A=(2,2,3)$, $B=(4,0,7)$, $C=(6,3,1)$, and $D=(2,-3,11)$ lie in the same plane.

  **Problem B:** Let $\underline{u},\underline{v}\in\mathbb{R}^3$. Show that

$$((\underline{u}+\underline{v})\times(\underline{u}-\underline{v}))\cdot\underline{u}=0 \quad \text{and} \quad ((\underline{u}+\underline{v})\times(\underline{u}-\underline{v}))\cdot\underline{v}=0$$