Middlebury College

Multivariable Calculus: Spring 2018

Homework

Due March 21, 6pm

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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*.

⋆ ⋆ ⋆ You **are not allowed** to use any additional resources (e.g. solution manuals, `stackoverflow` etc). If you are concerned then please ask.

- The problems in parentheses are for extra practice and optional (in particular, they do not need to be submitted). **Problems for submission from the textbook are underlined. Additional problems not from the textbook must be submitted**.

  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.

- **Read/recap:** §2.3
- **Problems:** §$X.y$ refers to Chaper X, Section y of *Vector Calculus*, by Colley (4th Edition). All problems are taken from the 4th Edition.

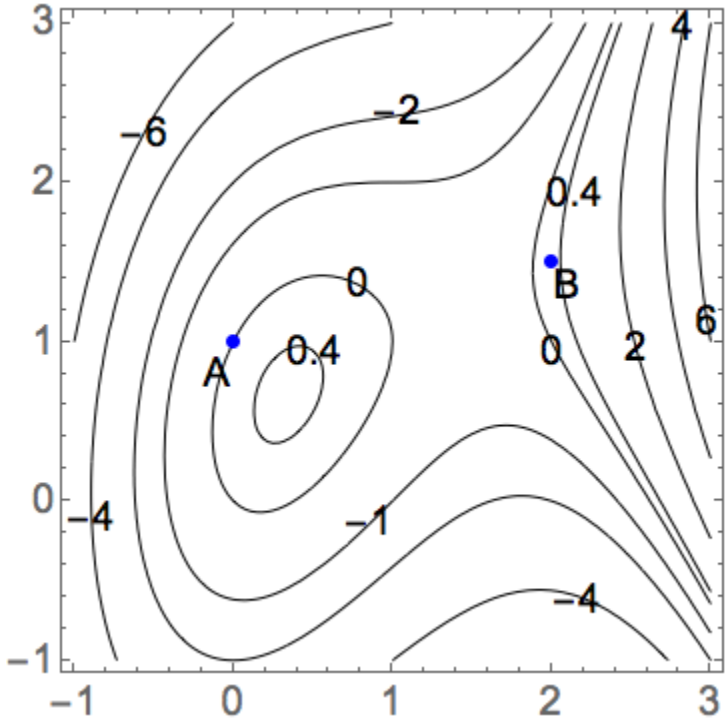
  §2.3: (1), (2), 3, 5, 8, (9), 11, (12), (13), 17, 21, (23), (25), 38, (39), 43, (44), (45)

Problem A: Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for the function

$$f(x,y) = \int_y^x e^{t^2}\,dt$$

Problem B: Below is the level curve diagram for some functions $f(x,y)$.

1. Use the level curve diagram to determine whether f_x, f_y are $> 0, = 0, < 0$ at the points A, B.
2. Using the information provided by the level curve diagram, determine a point C where $f_x = f_y = 0$.



Problem C: Suppose that $b^2 - 4c > 0$ so that equation $x^2 + bx + c = 0$ has two distinct real roots. Let r denote the larger root. Then, r is a function of b and c.

Give an approximate formula for the small change Δr in the value r produced by small changes Δb, Δc in the coefficients. Use this formula to determine the value for the larger root of $x^2 - 6.01x + 7.98 = 0$. Compare your answer with the exact value.