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.

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- Read/recap: §2.4, 2.5

  §2.4:  (1), 2, (3), 5, (7), 9, (10), (11), 18, (19), 23, (24), (27)
  §2.5:  (1), (2), 4, 7, (11), 13, 19, (20), 21, (22), (24), (25), 28, 30

Problem A: The level curve diagram from March 21 Homework is given on the following page. This is the level curve diagram of the function

\[ f(x, y) = x(x - 1)(x - 2) + (y - 1)(x - y) \]

Plotted on the level curve diagram is the point \( A = (0, 1) \).

1. Consider the path \( r(t) = (t, 1), t \in \mathbb{R} \).

   (a) Using the chain rule compute \( \frac{d}{dt}(f \circ r)(0) \).
(b) Explain geometrically why your answer in (a) is $> 0$, $= 0$ or $< 0$.

(c) Describe the relationship between $\frac{df}{dx}(f \circ x)$ and $\frac{\partial f}{\partial x}$.

2. Now consider the path $s(t) = (t, 2t + 1), t \in \mathbb{R}$. Observe that $s(0) = A$.

(a) Using the chain rule compute $(f \circ s)'(t)$.

(b) The graph of $f(x, y)$ models a mountain range in Vermont. You are walking along a path on this mountain range whose (local) coordinates are described by $(s(t), (f \circ s)(t))$, where $t$ denotes the time in hours before/after 12pm, April 1 2018. For example, at 9am, April 1 2018 you are at $(-3, -5, -72)$.

What is your highest/lowest elevation if you walk from 9am to 6pm on April 1 2018?

(c) Will you be tired at 12pm?

(d) What is the relationship between the graph of $(f \circ s)(t), -3 \leq t \leq 6$, and your elevation during your walk?