



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), come to office hours, or send me an email. 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. **This will make your life easier!** You can use **piazza** to arrange meet-ups. However, you must write your solutions *on your own* and *in your own words*.
- If you would like more practice then there are (hundreds of) problems in the supplementary course textbooks mentioned in the syllabus, or you can check out **khanacademy.org**.
- You **are not allowed** to use any additional resources. If you are concerned then please ask.

1. By completing the square, write the following quadratic polynomials in the form $A(x + B)^2 + C$. Determine which of the following quadratic polynomials are irreducible.

a.

$$x^2 + 3x + 1$$

b.

$$2x^2 + 3x + 5$$

c.

$$-3x^2 + x + 2$$

d.

$$3x^2 + x + 2$$

e.

$$5x^2 + 3 - 1$$

2. Using the method of partial fractions determine the following antiderivative problems.

a.

$$\int \frac{3x + 1}{x^3 + 4x} dx$$

b.

$$\int \frac{x}{x^2 + 2x + 5} dx$$

c.

$$\int \frac{x + 3}{x^2 + 4x + 7} dx$$

d.

$$\int \frac{x^2 - 29x + 5}{(x - 4)^2(x^2 + 3)} dx$$

For b., c. you will need to complete the square

3. Determine the antiderivative problem

$$\int \frac{\sin(x)}{\cos^2(x) + 5 \cos(x) + 6} dx$$

4. In this problem you will determine the general antiderivative of $\sec(x)$.

(a) Show that

$$\sec(x) dx = \frac{\cos(x)}{1 - \sin^2(x)}$$

(b) Use the substitution $u = \sin(x)$ to determine

$$\int \sec(x) dx$$

You will need to use partial fractions.

(c) Deduce that

$$\int \sec(x) dx = \ln |\sec(x) + \tan(x)| + C$$