What You Should Know and Common Errors

The purpose of the exams in the class you are taking is to test your knowledge of the class material; not your knowledge of previous material; however, you are expected to know previous material. If lack of such knowledge leads you to the wrong solution, you will lose points.

Below is a list of some common types of errors, sorted by the level at which you should have learned to correct procedure. I have illustrated most errors with actual examples from past exams. If you make such errors, do not expect to gain points by saying something like “I understood the problem, I just made an algebra error.”

This page of errors was started 12/3/99 and will grow with time as real-life examples accumulate.

**MOST BASIC**

- **Copying the problem incorrectly**: If you copy the problem incorrectly, you may receive partial credit or you may receive no credit. For example, a copying error that leads to a much simpler problem will probably lead to no credit.

- **Misunderstanding the problem**: If you are not sure what is being stated or asked for in a problem, it is up to you to ask. If you misinterpret a problem because you do not understand the terminology or the usage of the English language, expect to receive no credit. If you misinterpret a problem because it is ambiguously phrased, you will not be the only one in class to do so. In that case, credit will be given for both interpretations.

**PRECALCULUS**

- **Adding fractions**: You can’t add numerators and denominators. An example of such an error is

\[
\frac{2x + 1}{x^2} + \frac{2}{x + 1} = \frac{(2x + 1) + (2)}{(x^2) + (x + 1)} = \frac{2x + 3}{x^2 + x + 1}
\]

- **Manipulating powers**: Solve \(\sqrt{y} = x^{3/2} + C\) for \(y\).

\[
y = \left(\frac{x^{3/2}}{3} + C\right)^2 \quad \text{(correct)}
\]

\[
= \left(\frac{x^{3/2}}{3}\right)^2 + C^2 \quad \text{(wrong!)}
\]

Next \(\left(\frac{x^{3/2}}{3}\right)^2 = \frac{x^3}{3}\) or \(\frac{(3/2)^2}{9}\) both wrong!

Another power error: \(\sqrt{a + b} \neq \sqrt{a} + \sqrt{b}\).

- **Solving polynomial equations**: You are expected to be able to solve \(p(x) = 0\) when \(p(x)\) is easily factored into a product of linear and quadratic factors. For example, the solutions to \(x^2(1 - x^2) = 0\) are \(x = 0, 1, -1\).

- **Manipulating exponentials and/or logarithms**: Common mistakes are:
  - \(e^{b+c} = e^b + e^c\) (should be a product),
  - \(\ln(b + c) = \ln b + \ln c\) (no simple form), and
  - \(e^b e^c = e^{bc}\) (powers add). Here are some examples from exams:

\[
e^x e^x \; \text{does not equal} \; e^{x^2}
\]

\[
e^{\ln x + \ln C} \; \text{does not equal} \; x + C
\]

\[
e^y = e^{-x} + C \; \text{does not give} \; \ln(e^y) = \ln(e^{-x}) + \ln C.
\]
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- **Omitting the constant in indefinite integrals:**
  - **Logarithm integrals:** (a) People forget the absolute value in \( \int \frac{dx}{x} = \ln |x| + C \).
    (b) A denominator doesn’t always mean a logarithm. One error is \( \int \frac{dx}{e^x} = \ln e^x + C \). The correct answer is \( -e^{-x} + C \). To get a logarithm, \( \int f'(x)dx/f(x) = \ln |f(x)| + C \) — you need the \( f'(x) \) in the numerator.
    (c) Sometimes people make the reverse error of *not* recognizing that an integral gives a logarithm, for example \( \int \frac{dt}{t^2 + 1} \), and try all sorts of complicated and/or incorrect things to evaluate it. In particular, it is *not* \( t \arctan t \).