Midterm 1 Expectations

**Prerequisites**

Math is a naturally cumulative subject so there are several important things that you are expected to know well from previous classes. You will not be tested directly on this material, but you are assumed to be familiar with it:

- You should be able to find the graph of a line given two points on that line, or the slope of the line and a single point.
- You should be able to factor and expand simple polynomials.
- You are expected to be familiar with basic rules for powers, radicals, exponents, and logarithms.
- You are expected to know how the various trig functions are defined (in terms of angles and right triangles) and their values at integer multiples of $\pi/2$. For Midterm 1 you do not have to know any trig identities.
- You should know what $\arctan x$ and $\arcsin x$ are (inverse trig functions, see the last part of Section 1.5 in the book), and how to compute their basic values.
- You should be able to graph lines and recognize the graphs of other simple functions, as you learned in precalculus.
- You should know how to find the derivative of a function, and what the derivative means.

**What you need to know for Midterm 1**

- What definite integrals measure (net area).
- How to evaluate definite integrals (of rectangles, triangles, and circles) using geometry.
- Rules of definite integration.
- The statement of the Fundamental Theorem of Calculus.
- How to check your work for an indefinite integral problem (by differentiating).
- The integral formulas we’ve covered (see next section).
- You should know why there is a $+ C$ at the end of indefinite integral formula
- You should know that $u$-substitution is the integration version of the *chain rule* of differentiation.
- You should be able to use $u$-substitution to evaluate both indefinite and definite integrals.
• You should know how the bounds of a definite integral change after substitution.

• You should know that integration by parts is the integration version of the product rule of differentiation.

• You should be able to identify integrals that might be amenable to integration by parts (those whose integrands are products of functions), and know when not to use integration by parts (i.e., when an antiderivative formula or \( u \)-substitution will work).

• You should be able to apply the integration by parts formula to integrals both definite and indefinite.

• You are not required to use the LIATE strategy, but it is often helpful.

• You should be able to use an integration table to evaluate integrals that are not amenable to other methods we’ve learned. Table entries and trig formulas you might need will be provided on the exam.

• You should know the second part of the fundamental theorem of calculus (Section 6.4 of the textbook).

**Integrals you’re expected to know**

You need to know the following basic integration formulas:

\[
\int u^n \, du = \begin{cases} 
\frac{u^{n+1}}{n+1} + C & \text{if } n \neq -1 \\
\ln |u| + C & \text{if } n = -1 
\end{cases}
\]

\[
\int e^u \, du = e^u + C
\]

\[
\int \sin u \, du = -\cos u + C
\]

\[
\int \cos u \, du = \sin u + C
\]

You are also expected to be able to evaluate these integrals (though they may be derived without too much trouble from the other formulas along with the integration techniques we’ve learned):

\[
\int r^u \, du = \frac{r^u}{\ln r} + C \quad \text{where } r \text{ is a positive constant}
\]

\[
\int \tan u \, du = \ln |\sec u| + C
\]

\[
\int \ln u \, du = u \ln u - u + C
\]