Elementary Integrals

Chapter 6 and 7 homework and the subsequent exam will require you to compute antiderivatives and integrals. In the process of doing all that homework you will almost certainly memorize the first ten elementary integrals. It is very important to demonstrate all the steps in a homework or test problem so that I can see you doing the integration. However, some integrals are elementary enough that you are allowed to “know” them. This is the complete list of those.

Absolutely Must Memorize

1. \( \int x^r \, dx = \frac{x^{r+1}}{r+1} + C, \text{ if } r \neq -1 \)
2. \( \int x^{-1} \, dx = \ln |x| + C \)
3. \( \int e^x \, dx = e^x + C \)
4. \( \int \sin x \, dx = -\cos x + C \)
5. \( \int \cos x \, dx = \sin x + C \)

Definitely Should Memorize

6. \( \int e^{kx} \, dx = \frac{1}{k} e^{x} + C \)
7. \( \int \sin kx \, dx = -\frac{1}{k} \cos kx + C \)
8. \( \int \cos kx \, dx = \frac{1}{k} \sin kx + C \)
9. \( \int \frac{1}{kx + a} = \frac{1}{k} \ln |kx + a| + C \)
10. \( \int \frac{1}{x^2 + k^2} = \frac{1}{k} \tan^{-1} \left( \frac{x}{k} \right) + C \)

Other Elementary Functions

11. \( \int \ln x \, dx = x \ln x - x + C \)
12. \( \int \tan x \, dx = -\ln |\cos x| + C^1 \)
13. \( \int \cot x \, dx = \ln |\sin x| + C \)
14. \( \int \sec x \, dx = \ln |\sec x + \tan x| + C \)
15. \( \int \csc x \, dx = -\ln |\csc x + \cot x| + C^1 \)

Familiar Derivatives

16. \( \int \sec^2 x \, dx = \tan x + C \)
17. \( \int \csc^2 x \, dx = -\cot x + C \)
18. \( \int \sec x \tan x \, dx = \sec x + C \)
19. \( \int \csc x \cot x \, dx = -\csc x + C \)
20. \( \int \frac{1}{\sqrt{1 - x^2}} = \sin^{-1} x + C \)

\(^1\)Log laws and trig identities allow for equivalent though different looking answers. For this reason a table of integrals or MAPLE might not have exactly these formulas.