Elementary Antiderivatives for Exam Purposes

• You are NOT required to show work for an antiderivative that is on this list.

• If an antiderivative looks like one of these, but with something linear replacing $x$, you are still allowed to show no work.

• For ANY OTHER ANTIDERIVATIVE, you must show all steps and I must be convinced that you did the work, not your calculator.

1. $\int x^r \, dx = \frac{x^{r+1}}{r+1} + C$, if $r \neq -1$

2. $\int \frac{1}{x} \, dx = \ln |x| + C$

3. $\int e^x \, dx = e^x + C$

4. $\int \sin x \, dx = -\cos x + C$

5. $\int \cos x \, dx = \sin x + C$

6. $\int e^{kx} \, dx = \frac{1}{k} e^{kx} + C$

7. $\int \sin kx \, dx = -\frac{1}{k} \cos kx + C$

8. $\int \cos kx \, dx = \frac{1}{k} \sin kx + C$

9. $\int \frac{dx}{kx + a} = \frac{1}{k} \ln |kx + a| + C$

10. $\int \frac{dx}{x^2 + k^2} = \frac{1}{k} \tan^{-1} \left( \frac{x}{k} \right) + C$

11. $\int \ln x \, dx = x \ln x - x + C$

12. $\int \tan x \, dx = -\ln |\cos x| + C$

13. $\int \cot x \, dx = \ln |\sin x| + C$

14. $\int \sec x \, dx = \ln |\sec x + \tan x| + C$

15. $\int \csc x \, dx = -\ln |\csc x + \cot x| + C$

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. $\int \frac{dx}{\sqrt{1 - x^2}} = \sin^{-1} x + C$
Other (possibly) Useful Formulas

- I will not explain these formulas or how to use them.
- It is your job to know what the symbols in each formula mean.
- It is your job to know how, when, and why to apply any given formula.

\[
\begin{align*}
\sin^2 x + \cos^2 x &= 1 \\
\tan^2 x + 1 &= \sec^2 x \\
\sin^2 x &= \frac{1}{2} - \frac{1}{2} \cos 2x \\
\cos^2 x &= \frac{1}{2} + \frac{1}{2} \cos 2x \\
\sin ax \sin bx &= \frac{1}{2} [\cos(a - b)x - \cos(a + b)x] \\
\sin ax \cos bx &= \frac{1}{2} [\sin(a - b)x + \sin(a + b)x] \\
\cos ax \cos bx &= \frac{1}{2} [\cos(a - b)x + \cos(a + b)x] \\
S &= \frac{\Delta x}{3} (y_0 + 4y_1 + 2y_2 + 4y_3 + \cdots + 2y_{n-2} + 4y_{n-1} + y_n) \\
|E_T| &\leq \frac{M(b - a)^3}{12n^2} \\
|E_S| &\leq \frac{M(b - a)^5}{180n^4}
\end{align*}
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