Integration

The following table of integrals can be used without any further justification.

$\int x^n \, dx = \frac{1}{n+1}x^{n+1} + C \quad (n \neq -1)$	
$\int \frac{1}{x} \, dx = \ln\lvert x\rvert + C$	$\int \frac{1}{ax+b} \, dx = \frac{1}{a}\ln\lvert ax+b\rvert + C$
$\int e^x \, dx = e^x + C$	$\int e^{ax} \, dx = \frac{1}{a}e^{ax} + C$
$\int \cos(x) \, dx = \sin(x) + C$	$\int \sin(x) \, dx = -\cos(x) + C$
$\int \cos(ax) \, dx = \frac{1}{a}\sin(ax) + C$	$\int \sin(ax) \, dx = -\frac{1}{a}\cos(ax) + C$
$\int \sec^2(x) \, dx = \tan(x) + C$	$\int \csc^2(x) \, dx = -\cot(x) + C$
$\int \sec(x)\tan(x) \, dx = \sec(x) + C$	$\int \csc(x)\cot(x) \, dx = -\csc(x) + C$
$\int \frac{1}{x^2+a^2} \, dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$	$\int \frac{1}{x^2-a^2} \, dx = \frac{1}{2a}\ln\left\lvert\frac{x-a}{x+a}\right\rvert + C$
$\int \frac{1}{\sqrt{a^2-x^2}} \, dx = \sin^{-1}\left(\frac{x}{a}\right) + C$	$\int \frac{1}{\sqrt{x^2 \pm a^2}} \, dx = \ln\left\lvert x \pm \sqrt{x^2+a^2}\right\rvert + C$
$\int \tan(x) \, dx = \ln\lvert\sec(x)\rvert + C$	$\int \cot(x) \, dx = \ln\lvert\sin(x)\rvert + C$
$\int \sec(x) \, dx = \ln\lvert\sec(x) + \tan(x)\rvert + C$	$\int \csc(x) \, dx = \ln\lvert\csc(x) + \cot(x)\rvert + C$
$\int \sinh(x) \, dx = \cosh(x) + C$	$\int \cosh(x) \, dx = \sinh(x) + C$

Note: $\sinh(x) = \frac{1}{2}(e^x - e^{-x})$ and $\cosh(x) = \frac{1}{2}(e^x + e^{-x})$ are functions that often appear in engineering (we'll see them a bit this quarter).

For integrals that aren't in this table, some method of integration needs to be used. Most often you will need:

- Substitution (you will use this several times in almost every homework assignment)
- By Parts (you will also use this several times in most homework assignments)
- Partial Fractions (you will use this on almost every problem in the last two weeks of the quarter).

Trig integration and trig substitution will appear less often in this course (you still may see them time to time, but their appearance will be rare). You still need to remember your trig identities and you need to recognize when these methods would be appropriate.