Trigonometric Identities and Integrals

The following trigonometric identities should be memorized:

The Pythagorean Identities (you get the second from the first by dividing it by $\cos^2(x)$):

$$\sin^2(x) + \cos^2(x) = 1 \qquad \tan^2(x) + 1 = \sec^2(x)$$

The double angle identities:

$$\sin(2x) = 2\sin(x)\cos(x) \qquad \cos(2x) = \cos^2(x) - \sin^2(x)$$

The half angle identities:

$$\sin^2(x) = \frac{1}{2}(1 - \cos(2x)) \qquad \cos^2(x) = \frac{1}{2}(1 + \cos(2x))$$

Integrals you should be able to do without the table.

- Products of sine and cosine (one or more odd powers, and "simple" even powers).
- Integrate $\tan(x), \tan^{-1}(x), \sin^{-1}(x), \ln(u)$.

The Table

The following would be provided, if needed:

$$\sin(x+y) = \sin(x)\cos(y) + \cos(x)\sin(y) \qquad \cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$$

The following partial table of integrals will be provided.

- $\displaystyle\int \tan(u)\,du = \ln|\sec(u)| + C$
- $\displaystyle\int \cot(u)\,du = \ln|\sin(u)| + C$
- $\displaystyle\int \tan^n(u)\,du = \frac{1}{n-1}\tan^{n-1}(u) - \int \tan^{n-2}(u)\,du$
- $\displaystyle\int \sec(u)\,du = \ln|\sec(u) + \tan(u)| + C$
- $\displaystyle\int \csc(u)\,du = \ln|\csc(u) - \cot(u)| + C$
- $\displaystyle\int \sec^n(u)\,du = \frac{1}{n-1}\sec^{n-2}(u)\tan(u) + \frac{n-2}{n-1}\int \sec^{n-2}(u)\,du$

- $\displaystyle\int \sin(au)\sin(bu)\,du = \frac{\sin((a-b)u)}{2(a-b)} - \frac{\sin((a+b)u)}{2(a+b)}$
- $\displaystyle\int \sin(au)\cos(bu)\,du = -\frac{\cos((a-b)u)}{2(a-b)} - \frac{\cos((a+b)u)}{2(a+b)}$
- $\displaystyle\int \cos(au)\cos(bu)\,du = \frac{\sin((a-b)u)}{2(a-b)} + \frac{\sin((a+b)u)}{2(a+b)}$