$$\int u\,dv = uv - \int v\,du \tag{1}$$

This lecture will consist of working through more challenging IBP problems, including definite integrals, examples where the original integral is returned, and will teach the tabular method (*note the tabular method is not covered in the textbook*). Use the table below as a useful to do list for IBP:

(1) Check for an obvious substitution that can be made.
(2) Look for possible dv based on what you can integrate.
(3) After picking the "best" dv assign *everything else* to u (you can't ignore terms!).
(4) Calculate du and v.
(5) Either integrate what's left, use IBP again, or start over if you're stuck.

Note: IBP is not deterministic so sometimes we will select the wrong dv and u. That is O.K! Keep trying and with practice the right organization will become easier to see.

EXAMPLE 1. Evaluate $\int e^x \sin(x)\,dx$

EXAMPLE 2. Evaluate $\int_0^2 x \tan^{-1}(x^2)\,dx$

The **tabular method** is a good way to quickly set up a problem that involves multiple integration by parts. The general set up is to make a table of the integrations and derivations necessary (usually until we differentiate and get 0), and use this table to "pick out" the solution. This is best seen in an example,

EXAMPLE 3. Evaluate $\int (x^4 - 3x + 2)e^x \, dx$ using the tabular method

EXAMPLE 4. Evaluate $\int (x^3 + 2x^2 + 4x + 1) \sin x \, dx$

EXAMPLE 5. Find a "reduction formula" for $\int (\ln x)^n \, dx$