

## Integration By Parts

### Guidelines:

1. Try letting “dv” be the most complicated portion of the integrand that fits a basic integration rule. Then “u” will be the remaining factor(s) of the integrand.
2. Try letting “u” be the portion of the integrand whose derivative is a simpler function than “u”. Then “dv” will be the remaining factor(s) of the integrand.
3. In integrands involving a single factor such as  $\int \ln x dx$  you should let “dv” = “dx”.
4. When making repeated applications of integration by parts you need to be careful not to interchange the substitutions in successive applications. You will return to the original integrand but when you try to solve for the original integrand algebraically it will disappear.
5. When making repeated applications of integration by parts, you should watch for the appearance of a *constant multiple* of the original integrand.

### Summary of Common Integrals Using Integration By Parts

1. For integrals of the form  $\int x^n e^{ax} dx, \int x^n \sin ax dx, \int x^n \cos ax dx$  let  $u = x^n$  and  $dv = e^{ax} dx, \sin ax dx, \text{ or } \cos ax dx$ .
2. For integrals of the form  $\int x^n \ln x dx, \int x^n \arcsin x dx, \int x^n \arctan x dx$  let  $u = \ln x, \arcsin x, \text{ or } \arctan x$  and  $dv = x^n dx$ .
3. For integrals of the form  $\int e^{ax} \sin bx dx, \int e^{ax} \cos bx dx$  let  $u = \sin bx, \text{ or } \cos bx$  and  $dv = e^{ax} dx$