

MATH 162: Calculus II
Framework for Tues., Jan. 30
Integration by Parts

Integration by parts formula:

$$\int u \, dv = uv - \int v \, du$$

Remarks

- Counterpart to product rule for differentiation
- Applicable for definite integrals as well:

$$\int_a^b u \, dv = uv \Big|_a^b - \int_a^b v \, du.$$

- Technique used when integrands have the form:
 - $p(x)e^{ax}$, $p(x)e^{ax}$, where $p(x)$ is a polynomial, a a constant
Let u be the polynomial part; number of iterations equals degree of p
 - $p(x)\cos(bx)$, $p(x)\sin(bx)$, where $p(x)$ is a polynomial, b a constant
Let u be the polynomial part; number of iterations equals degree of p
 - $e^{ax}\cos(bx)$, $e^{ax}\sin(bx)$, where a, b are constants
No rule for which part u equals; requires 2 iterations and algebra

Some integrals (less obviously) done by parts:

- $\int \ln x \, dx$ (see p. 450)
- $\int \arccos x \, dx$ (and other inverse fns; see p. 454)
- $\int \sec^3 x \, dx$ (see p. 459)