

International Institute for  
Technology and Management



Unit 05a : Mathematics 1

## Handout #10

### Integration II: Anthony & Biggs pp: 330 - 333

$f(x)$	$\int f(x) dx$
$K$ , $K$ is a Constant Examples: $\int 5 dx$ $\int dx$	$Kx + C$ $5x + C$ $x + C$
$x^n$ , $n \neq -1$ Examples: $\int x^7 dx$ $\int (2x^3 - 5x - 1) dx$	$\frac{x^{n+1}}{n+1} + C$ $\frac{x^{7+1}}{7+1} + C = \frac{x^8}{8} + C$ $2\frac{x^4}{4} - 5\frac{x^2}{2} - x + C = \frac{x^4}{2} - \frac{5x^2}{2} - x + C$
$e^x$ $e^{ax}$ Examples: $\int e^{3x} dx$ $\int e^x (e^x - 2) dx$	$e^x + C$ $\frac{1}{a} e^{ax} + C$ $\frac{1}{3} e^{3x} + C$ $\int (e^{2x} - 2e^x) dx = \frac{1}{2} e^{2x} - 2e^x + C$
$\int \frac{dx}{x}$ $\int \frac{dx}{ax + b}$ Example: $\int (t+1 - \frac{4}{t+2}) dt$	$\ln x + C$ $\frac{1}{a} \ln(ax + b)$ $\frac{t^2}{2} + t - 4 \ln(t+2) + C$

$f(x)$	$\int f(x) dx$
Sinx Sin ax Example: $\int (x + \sin 2x) dx$	- Cos x + C $-\frac{1}{a} \text{Cos } ax + C$ $\frac{x^2}{2} - \frac{1}{2} \cos 2x + C$
Cosx Cos ax Example: $\int (2 + \cos 3x) dx$	Sin x + C $\frac{1}{a} \text{Sin } ax + C$ $2 + \frac{1}{3} \sin 3x + C$
Example: Calculate: $\int_1^2 \frac{\sin(\ln x)}{x} dx$	
Let $u = \ln x \Rightarrow du = \frac{dx}{x} \Rightarrow \int_1^2 \frac{\sin(\ln x)}{x} dx = \int_1^2 \sin u du = -\cos u$	
$= [-\cos(\ln x)]_1^2 = -\cos(\ln 2) - [-\cos(\ln 1)] = -\cos(\ln 2) + \cos 0$	
$= -\cos(\ln 2) + 1 = 1 - \cos(\ln 2) \quad \{ \text{since } \ln 1 = 0 \}$	
Example: $\int te^{t^2} dt$	
Let $u = t^2 \Rightarrow du = 2t dt \Rightarrow t dt = \frac{du}{2}$	
$\int te^{t^2} dt = \int e^u \frac{du}{2} = \frac{1}{2} \int e^u du = \frac{1}{2} e^u + C = \frac{1}{2} e^{t^2} + C$	