INTEGRATION

- Indefinite integration reverses differentiation, in the same way the multiplication reverses division. Also known as the anti-derivative of a•
- If $\frac{d}{dx}F(x) = f(x)$, then $\int f(x) dx = F(x) + c$
- the integrand, c = constant of integration, dx indicates that we integrate w.r.t. x
- For indefinite integrals, always include the c
- Note the $\int f(x)$ just means integral sign f(x), while $\int f(x) dx$ means that we have to integrate f(x) w.r.t. x.
- Notation is important here. •
- The relationship between indefinite integral and derivative:

 $\frac{d}{dx}\int f(x)\,dx = f(x).$

• The derivative of the indefinite integral = the integrand

 $\int f(x) \, dx = F(x) + c.$

• The indefinite integral of the integrand is the indefinite integral

- **RULES FOR EXPONENTIAL FUNCTIONS** Recall that: $\frac{d}{dx}e^x = e^x$ Notesale.co.uk To reverse on: $\int (e^x) dx \neq e^0 + c$ Also, note that: $\frac{d}{dx}e^{kx} = ke^{kx}$, so $\int (e^{kx}) dx = \frac{e^{kx}}{k} + c$
- Also recall that: $\frac{d}{dx}e^{f(x)} = f'(x)e^{f(x)}$
- To reverse this: $\int (f'(x)e^{f(x)}) dx = e^{f(x)} + c$
- Consider examples 18.10-11