

# Lecture 26

Monday, February 27, 2023 7:41 AM

\* Questions...

Integration by parts:

Indefinite integral:

$$\int u'v dx = uv - \int uv' dx$$

Definite integral

$$\int_a^b u'v dx = uv \Big|_a^b - \int_a^b uv' dx$$

Ex

$$\int_0^{\pi} x \sin x dx$$

$$u' = \sin x \longrightarrow u = -\cos x$$

$$v = x \longrightarrow v' = 1$$

$$\int_0^{\pi} x \sin x dx = -x \cos x \Big|_0^{\pi} - \int_0^{\pi} -\cos x dx$$

$$= -\pi(-1) - 0 + \int_0^{\pi} \cos x dx$$

$$= \pi + \sin x \Big|_0^{\pi}$$

$$= \pi$$

$$\underline{\underline{\int_0^4 e^{\sqrt{x}} dx}}$$

$$u = \sqrt{x}$$

$$du = u' dx = \frac{1}{2\sqrt{x}} dx = \frac{1}{2u} dx$$

$$dx = 2u du$$

$$\int_0^4 e^{\sqrt{x}} dx = \int_0^2 e^u 2u du = \int_0^2 e^x 2x dx$$

$$u' = e^x \longrightarrow u = e^x$$

$$v = 2x \longrightarrow v' = 2$$

$$\int_0^2 e^x 2x dx = e^x 2x \Big|_0^2 - \int_0^2 2e^x dx$$

$$= 4e^2 - 2e^2 \Big|_0^2$$

$$= 4e^2 - (2e^2 - 2)$$

$$= 2 + 2e^2$$

Tips:

$$\int x^n \sin(ax) dx \dots \dots u = \sin(ax), v = x^n$$

$$\int x^n e^{ax} dx \dots \dots u = e^{ax}, v = x^n$$