

§ 7.2 Integration by parts

Today we get some more practice with integration by parts.

Examples (parts d, e from Friday's worksheet)

$$\int x^3 e^{x^2} dx$$

$$\int x^2 e^{4x} dx$$

See worksheet solutions

Example $\int \cos^2 \theta \, d\theta = \int \cos \theta \cdot \cos \theta \, d\theta$

$$u = \cos \theta \quad dv = \cos \theta \, d\theta$$

$$du = -\sin \theta \, d\theta \quad v = \sin \theta$$

$$= \sin \theta \cos \theta + \int \sin^2 \theta \, d\theta$$

$$= \sin \theta \cos \theta + \int (1 - \cos^2 \theta) \, d\theta$$

$$= \sin \theta \cos \theta + \theta - \int \cos^2 \theta \, d\theta$$

$$\Rightarrow \int \cos^2 \theta \, d\theta = \sin \theta \cos \theta + \theta - \int \cos^2 \theta \, d\theta$$

$$\Rightarrow 2 \int \cos^2 \theta \, d\theta = \sin \theta \cos \theta + \theta$$

$$\Rightarrow \int \cos^2 \theta \, d\theta = \frac{1}{2} \sin \theta \cos \theta + \frac{1}{2} \theta + C$$