

Name: _____

Notesheet. Section 7.1: Integration by parts part II

Math 1220

Remark 1. *When picking u and dv in integration by parts, we want to choose so that*

(a) du is simpler than u .

(b) dv is easy to integrate.

Challenge 2. Use integration by parts to solve the following integrals

(a) $\int \ln x \, dx$

(b) $\int x \ln x \, dx$

(c) $\int x(x+4)^{-2} \, dx$

(d) $\int e^x \sin x \, dx$. (Hint: use integration by parts twice!)

Challenge 3. Find the average value of $f(x) = x^2 \ln x$ on the interval $[1, 3]$.

Challenge 4. Evaluate $\int_1^3 x f''(x) dx$ if $f(1) = 1, f'(1) = 0, f(3) = 2, f'(3) = 1$.

Challenge 5. Sometimes integrals get really tricky, requiring you to use both u -substitution and integration by parts! Solve the following integrals.

(a) $\int_{\sqrt{\pi/2}}^{\sqrt{\pi}} \theta^3 \cos(\theta^2) d\theta$

(b) $\int \cos \sqrt{x} dx$

(c) $\int \sin(\ln(x)) dx$