

MA 114 Worksheet #01: Integration by parts

1. Which of the following integrals should be solved using substitution and which should be solved using integration by parts?

(a) $\int x \cos(x^2) dx,$

(c) $\int \frac{\ln(\arctan(x))}{1+x^2} dx,$

(b) $\int e^x \sin(x) dx,$

(d) $\int xe^{x^2} dx$

2. Solve the following integrals using integration by parts:

(a) $\int x^2 \sin(x) dx,$

(f) $\int x^4 \ln(x) dx$

(b) $\int (2x+1)e^x dx,$

(g) $\int e^x \sin x dx$

(c) $\int x \sin(3-x) dx,$

(h) $\int x \ln(1+x) dx$ Hint: Make a substitution first, then try integration by parts.

(d) $\int 2x \arctan(x) dx,$

(e) $\int \ln(x) dx$

3. Let $f(x)$ be a twice differentiable function with $f(1) = 2$, $f(4) = 7$, $f'(1) = 5$ and $f'(4) = 3$. Evaluate $\int_1^4 x f''(x) dx$

4. If $f(0) = g(0) = 0$ and f'' and g'' are continuous, show that

$$\int_0^a f(x)g''(x) dx = f(a)g'(a) - f'(a)g(a) + \int_0^a f''(x)g(x) dx.$$