

**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)  $\int x e^{x^2} dx$

2. Solve the following integrals using integration by parts:

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

(f)  $\int x^5 \ln(x) dx$

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

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

(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

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

## MA 114 MathExcel-Worksheet # 1: Integration by Parts and Trig Derivatives

1. Evaluate the following integrals.

$$(a) \int \frac{1}{9+x^2} dx$$

$$(b) \int \frac{1}{\sqrt{1-4x^2}} dx$$

$$(c) \int x\sqrt{2x+1} dx$$

2. Evaluate the following integrals by making a substitution and then using integration by parts.

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

$$(b) \int t^3 e^{-t^2} dt$$

$$(c) \int_0^\pi e^{\cos(t)} \sin(2t) dt$$