

Write your questions
and thoughts here!

Integration by parts is typically used for the integration of the product of two functions.

$$\int f(x)g'(x) =$$

Integration by parts is based on the product rule:

$$[fg]' = f'g + fg'$$

Basic rule for choosing f and g' :

1. For f : choose something that becomes simpler when you differentiate.
2. For g' : choose something that can easily be integrated.

1. $\int x \sin(x) dx$

$f =$

$g' =$

$f' =$

$g =$

Tabular Integration: Differentiate to 0 for the chosen $f(x)$. Integrate your chosen $g'(x)$ the same number of times. Follow the sign convention, which is plus/minus repeating.

2. $\int x^4 \sin x dx$

$$\underline{f(x)}$$

$$\underline{g'(x)}$$

6.11 Integration by Parts

Calculus

Practice

Integrate the following.

1. $\int x \cos(x) dx$

2. $\int 2x \cos(3x + 1) dx$

3. $\int x^2 \sin(x) dx$

4. $\int 4xe^{3x+1} dx$

5. $\int_1^{e^2} x^4 \ln x dx$

6. $\int \ln x dx$

7. $\int_1^2 (3x^2 - 2x + 1) \ln x \, dx$

8. $\int x^3 e^x \, dx$

9. The table gives values of f , f' , g , and g' for selected values of x . If $\int_0^3 f'(x)g(x) \, dx = 6$, then $\int_0^3 f(x)g'(x) \, dx = ?$

x	0	3
$f(x)$	1	5
$f'(x)$	5	-3
$g(x)$	-4	3
$g'(x)$	3	2

10. Let f be a twice-differentiable function with selected values of f and its derivatives shown in the table. What is the value of $\int_0^3 x f''(x) \, dx$?

x	$f(x)$	$f'(x)$	$f''(x)$
0	2	-2	5
3	5	7	-2

6.11 Integration by Parts

11. $\int x \cos 2x \, dx$

(A) $\frac{1}{2}x^2 \sin(2x) + C$

(B) $\frac{1}{2}x^2 \cos(2x) + \frac{1}{2}\sin(2x) + C$

(C) $\frac{1}{2}x \sin(2x) - \frac{1}{4}\cos(2x) + C$

(D) $\frac{1}{2}x \sin(2x) + \frac{1}{4}\cos(2x) + C$

12. $\int_1^e x^4 \ln x \, dx$

A) $\frac{6e^5-1}{25}$

(B) $\frac{4e^5+1}{25}$

(C) $\frac{1-e^3}{3}$

(D) e^4

13. Let f be a differentiable function such that $\int f(x) \cos x \, dx = f(x) \sin x - \int \frac{1}{2}x^3 \sin x \, dx$. Which of the following could be $f(x)$.

A) $\frac{1}{2}\sin x$

(B) $\frac{1}{2}\cos x$

(C) $\frac{1}{8}x^4$

(D) $\frac{1}{2}x^3$