A203

Integration by Parts using the **Tabular Method**

example 1. $\int x^3 \cos 2x\, dx =$

Pick u and dv, but use v '

$u = x^3$ and $dv = \cos 2x\, dx$ ∅ $v' = \cos 2x$

Alt Signs	u & Deriv's	v ' & Int's
+	x^3	$\cos 2x$
-	$3x^2$	$\frac{1}{2} \sin 2x$
+	$6x$	$-\frac{1}{4} \cos 2x$
-	6	$-\frac{1}{8} \sin 2x$
+	0	$\frac{1}{16} \cos 2x$

If the center column becomes 0, we stop.

We write the sum of these products:

R1C1 * R1C2 * R2C3

R2C1 * R2C2 * R3C3

etc.

Answer:

$$\int x^3 \cos 2x\, dx = \boxed{\frac{1}{2} x^3 \sin 2x + \frac{3}{4} x^2 \cos 2x - \frac{3}{4} x \sin 2x - \frac{3}{8} \cos 2x + C}$$

Example 2 $\int e^{2x} \sin x \, dx =$

Pick u = e^{2x} and v ' = sin x

Alt Signs	u & Deriv's	v ' & Int's
+	e^{2x}	sin x
-	$2e^{2x}$	-cos x
+	$4e^{2x}$	-sin x

Note that the center column will not become zero, but the R3C3 row looks similar to R1C3.

We write the sum of these products:
R1C1 * R1C2 * R2C3
R2C1 * R2C2 * R3C3

But, Since there is no zero in R3C2, we also use the last Row, but the product goes inside an Integral Sign.

$$\int e^{2x} \sin x \, dx = -e^{2x} \cos x + 2e^{2x} \sin x + \int -4e^{2x} \sin x \, dx$$

Moving the Right Integral over, we get:

$$5\int e^{2x} \sin x \, dx = -e^{2x} \cos x + 2e^{2x} \sin x + K$$

$$\boxed{\int e^{2x} \sin x \, dx = -\frac{1}{5} e^{2x} \cos x + \frac{2}{5} e^{2x} \sin x + C}$$

AP Calculus BC 2 Assignment 203 Thursday, January 29, 2015 Hour Name ______________________

Use the Tabular Method for Integration by Parts.

1. $\int x^3 \sin x\, dx =$

2. $\int e^{2x} \sin x\, dx =$

3. $\int e^{x} \cos 2x\, dx =$

4. Solve: $\dfrac{dy}{dx} = x^2 \sqrt{x-1}$

5. $\int x^2 e^{2x}\, dx =$

6. $\int x^3 e^{-2x}\, dx =$

7. $\int x^2 \cos x\, dx =$

8. $\int e^{3x} \cos 2x\, dx =$