$$I = \int \underbrace{f(x)}_{u}\, \underbrace{g(x)\, dx}_{dv}$$

$$\begin{cases} u = f(x) \Longrightarrow du = f'(x)\, dx \\ dv = g(x)\, dx \Longrightarrow v = \int g(x)\, dx \end{cases}$$

pind: $I = u.v - \int v\, du$

log — đa — LG — Mũ.

EX: $I = \int x . \cos x \, dx$

$$\begin{cases} u = x \\ dv = \cos x\, dx \end{cases} \Rightarrow \begin{cases} du = dx \\ v = \int \cos x\, dx = \sin x \end{cases}$$

$$I = x \sin x - \int \sin x\, dx$$
$$= x \sin x + \cos x + C$$

2/ $I = \int (2x+1) \cos 3x \, dx$

$$\begin{cases} u = 2x + 1 \\ dv = \cos 3x\, dx \end{cases} \Rightarrow \begin{cases} du = 2dx \\ v = \frac{1}{3} \sin 3x \end{cases}$$

$$I = (2x+1)\frac{1}{3} \sin 3x - \int \frac{1}{3} \sin 3x . 2\, dx$$
$$= \frac{1}{3}(2x+1) \sin 3x + \frac{2}{9} \cos 3x + C$$

3/ $I = \int 2x . e^x \, dx$

$$\begin{cases} u = 2x \\ dv = e^x dx \end{cases} \Rightarrow \begin{cases} du = 2dx \\ v = e^x \end{cases}$$

$$I = 2x \cdot e^x - 2e^x + C$$

u		dv
$2x$	$+$	e^x
2	$-$	e^x
0		e^x

$$I = 2x \cdot e^x - 2 \cdot e^x + C$$

$$I = \int x^2 \cdot e^{3x} dx$$

u		dv
x^2	$+$	e^{3x}
$2x$	$-$	$\frac{1}{3} e^{3x}$
2	$+$	$\frac{1}{9} e^{3x}$
0		$\frac{1}{27} \cdot e^{3x}$

$$I = \frac{1}{3} x^2 \cdot e^{3x} - \frac{2}{9} x \cdot e^{3x} + \frac{2}{27} \cdot e^{3x} + C$$

1) $I = \int x^2 \cdot e^x dx = (x^2 + mx + n) e^x + C$

find $m \cdot n = ?$

2) $I = \int (x^2 + 2x - 1) e^x dx$

3) $I = \int x^3 \cdot \cos 2x \, dx$

x^2	e^x
$2x$	e^x
2	e^x
0	e^x

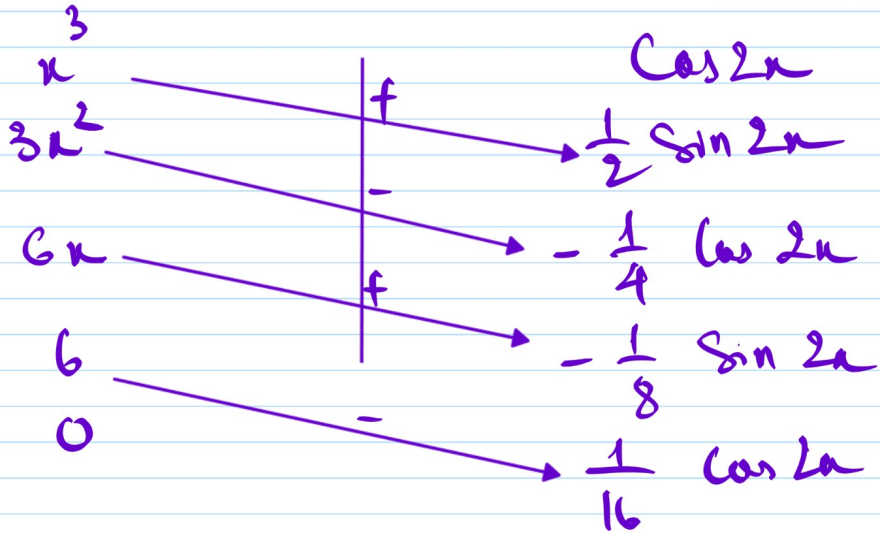
$I = x^2 e^x - 2x e^x + 2e^x + C$

$= (x^2 - 2x + 2) e^x + C$

4| $I = \int (x^3+2)\cdot 2^x \, dx$ $\Rightarrow \begin{cases} m=-2 \\ n=2 \end{cases}$

$\Rightarrow \underline{m \cdot n = -4}$

3|



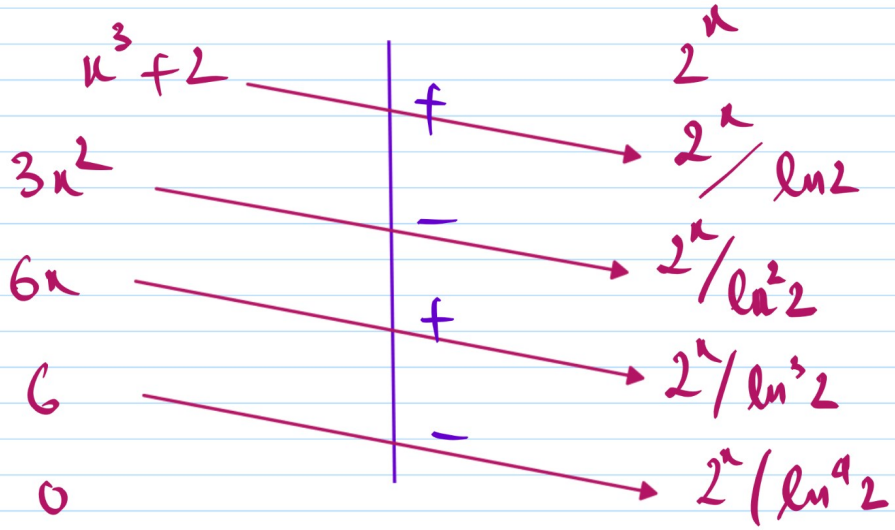
$$I = \frac{x^3}{2}\sin 2x + \frac{3}{4}x^2\cdot\cos 2x - \frac{3}{4}x\sin 2x - \frac{3}{8}\cos 2x + C$$

4| $I = \int (x^3+2)\cdot 2^x \, dx$

$= \int (2^x\cdot x^3 + 2^x\cdot 2)\, dx$

$= \int (2^x\cdot x^3 + 2^{x+1})\, dx$ $\qquad \int a^x dx = \frac{a^x}{\ln a} + C$

$= \int 2^x\cdot x^3\, dx + \int 2^{x+1}\, dx$



Approximating Areas (Cấp xỉ diện tích)

Sigma Notation: $\sum_{i=1}^{5} i =$

EX: Write in sigma notation and valuate the sum of terms 3^i for: $i = 1, 2, 3, 4, 5$

$$\sum_{i=1}^{5} 3^i = 3^1 + 3^2 + 3^3 + 3^4 + 3^5 = 363$$

EX: Write the sum in sigma notation:

$1 + 1/4 + 1/9 + 1/16 + 1/25$

$$\sum_{i=1}^{5} \frac{1}{i^2} = 1 + \frac{1}{4} + \frac{1}{9} \ldots$$

EX: $2 + 4 + 8 + 16 + 32$

$$\sum_{i=1}^{5} 2^i =$$

c : constant . for all integers m and n with , $1 \le m \le n$.

1/ $\sum_{i=1}^{n} c = n \cdot c$

2/ $\sum_{i=1}^{n} c a_i = c \sum_{i=1}^{n} a_i$

3/ $\sum_{i=1}^{n} (a_i \pm b_i) = \sum_{i=1}^{n} a_i \pm \sum_{i=1}^{n} b_i$

4/ $\sum_{i=1}^{n} a_i = \sum_{i=1}^{m} a_i + \sum_{i=m+1}^{n} a_i$

5/ $\sum_{i=1}^{n} i = 1+2+3+\dots+n = \boxed{\frac{n(n+1)}{2}}$

6/ $\sum_{i=1}^{n} i^2 = 1^2+2^2+3^2+\dots+n^2 = \boxed{\frac{n(n+1)(2n+1)}{6}}$

7/ $\sum_{i=1}^{n} i^3 = 1^3+2^3+3^3+\dots+n^3 = \frac{n^2(n+1)^2}{4}$

Write using Sigma notation and evaluate

a/ the sum of the terms

$(i-3)^2$ for $i = 1, 2, \dots, 200$

$$\sum_{i=1}^{100} (i-3)^2 = \sum_{i=1}^{100} (i^2 - 6i + 9)$$

$$= \sum_{i=1}^{100} i^2 - \sum_{i=1}^{100} 6i + \sum_{i=1}^{100} 9$$

$$= \frac{100\,(100+1)(2\cdot 100+1)}{6} - 6 \cdot \frac{100\cdot(100+1)}{2} + 100 \cdot 9$$

$$= 308950$$

b) $(i^3 - i^2)$ for $i = 1, 2 \ldots, 6$.

$$\sum_{i=1}^{6} (i^3 - i^2) = \sum_{i=1}^{6} i^3 - \sum_{i=1}^{6} i^2$$

$$= \frac{6^2 (6+1)^2}{4} - \frac{6\cdot(6+1)\cdot(2\cdot 6+1)}{6}$$

$=$