Author: Karolina K.
EPH 1

$$\boxed{\int x^2 \cos x \, dx} =$$

An indefinite integral of x square times cosine of x, dx

$$\Downarrow$$

$$\left\{\begin{array}{ll} g(x) = x^2 & g'(x) = 2x \\ f'(x) = \cos x & f(x) = \sin x \end{array}\right\}$$

1° 2°

Now I will use the method of parts. I choose g(x) to be x square and f'(x) to be cosine of x. This way g'(x) is equal two x and f(x) is equal sine of x

$$= x^2 \sin x - \int 2x \sin x \, dx =$$

In this step I will multiply it crosswise (see arrow 1° in the previous step) and subtract an indefinite integral containing the result of vertical multiplication (see arrow 2° in the previous step)

$$= x^2 \sin x - 2\int x \sin x \, dx =$$

In this step we can put 2 in front of the integral.

$$\Downarrow$$

$$\left\{\begin{array}{ll} g(x) = x & g'(x) = 1 \\ f'(x) = \sin x & f(x) = -\cos x \end{array}\right\}$$

3° 4°

Now I have to use the method of parts once again. I choose g(x) to be x and f'(x) to be sine of x. This way g'(x) is equal 1 and f(x) is equal minus cosine of x

$$= x^2 \sin x - 2\left(x \cdot (-\cos x) - \int -\cos x \, dx\right) =$$

In this step I will multiply it crosswise (see arrow 3° in the previous step) and subtract an integral containing the result of vertical multiplication (see arrow 4° in the previous step)

$$= x^2 \sin x + 2x\cos x - 2\int \cos x \, dx =$$

In this step we have to multiply two by the content of the bracket

$$\boxed{= x^2 \sin x + 2x\cos x - 2\sin x + C}$$

Following the integration formula we can compute the integral of cosine of x and our final result is: x square times sine of x plus two x times cosine of x minus two times sine of x plus a constant C

DON'T FORGET ABOUT THE CONSTANT !!!