Answer on Question #46134– Math – Integral Calculus

Question:

Integrate the following expression with respect to x:

$$\int x \cdot \cos ax^2 \cdot dx$$

cos^3x+c

sin2x+c

sec^2x+1

1/2asinax^2+c

Solution:

Let us change the variable of integration

$$t = ax^2.$$

Then the differential dx takes the form

$$dx = d\sqrt{\frac{t}{a}} = \frac{dt}{2\sqrt{ta}}.$$

Therefore

$$\int x \cdot \cos ax^2 \cdot dx = \int \sqrt{\frac{t}{a}} \cdot \cos t \cdot \frac{dt}{2\sqrt{ta}} = \frac{1}{2a}\int \cos t \cdot dt\,.$$

Consequently

$$\frac{1}{2a}\int \cos t \cdot dt = \frac{\sin t}{2a} + const = \frac{\sin ax^2}{2a} + const\,.$$

Thus the final answer is

$$\int x \cdot \cos ax^2 \cdot dx = \frac{\sin ax^2}{2a} + const\,.$$

Answer: the last answer is correct

$$\int x \cdot \cos ax^2 \cdot dx = \frac{\sin ax^2}{2a} + const\,.$$