## Answer on Question #52314 – Math – Calculus

What is the integral of (1+cos 4x)^2 dx ?

### Solution

### Method 1

$\int(1+cos4x)^2dx = \int(1+cos^2 4x+2cos4x)\,dx = \int(1+2cos4x)dx + \int cos^2 4xdx$=

=$x+\frac{2sin4x}{4}+\int cos^2 4x\,dx$=

using trigonometric formula $cos^2 x = \frac{1+cos2x}{2}$ we get

=$x+\frac{2sin4x}{4}+\int\frac{1+cos8x}{2}dx$=$x+\frac{sin4x}{2}+\frac{x}{2}+\frac{sin8x}{16}+C = \frac{3x}{2}+\frac{sin8x}{16}+\frac{sin4x}{2}+C$,

where $C$ is an arbitrary real constant.

Answer: $\frac{3x}{2}+\frac{sin8x}{16}+\frac{sin4x}{2}+C$

### Method 2

It follows that $1+cos2t = 2cos^2 t$ from the double - angle formula

$\cos(2t) = cos^2 t - sin^2 t = 2cos^2 t - 1 = 1 - 2sin^2 t$ .

Compute

$$\int(1+cos4x)^2dx = \int(2cos^2(2x))^2dx = \int 4cos^4(2x)dx =$$

=using power-reduction formula $cos^4 t = \frac{3+4cos2t+cos4t}{8}$ we get=

$= \int 4\frac{3+4cos4x+cos8x}{8}dx = \int\frac{3}{2}dx + 2\int cos4xdx + \frac{1}{2}\int cos8xdx = \frac{3}{2}x + \frac{2}{4}sin4x + \frac{1}{16}sin8x + C =$

$= \frac{3x}{2}+\frac{sin8x}{16}+\frac{sin4x}{2}+C,$

where $C$ is an arbitrary real constant.