

Given formula: $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$, $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$.

Problem 1. Calculate indefinite integrals.

(1) $\int x^2 e^{x^3} dx$

(2) $\int \sin(\sin x) \cos x dx$

(3) $\int \frac{x}{\sqrt{3-12x^2}} dx$

(4) $\int \frac{3}{\sqrt{3-12x^2}} dx$

(5) $\int \sin x \cos^4 x dx$

(6) $\int x \sin^2(x^2) dx$

$$(7) \int \frac{1}{x(1+2(\ln x)^2)} dx$$

$$(8) \int \sin^2 x \cos^2 x dx$$

Problem 2. Calculate

$$\frac{d}{dx} \int_{\sin x}^{x^2} \frac{1}{1+t^3} dt$$

Problem 3. Calculate definite integrals.

$$(1) \int_0^1 e^x \cos(e^x) dx$$

$$(2) \int_0^{\pi/2} \frac{\cos x}{3 + \sin x} dx$$

$$(3) \int_0^1 (3x^2 + 1)\sqrt{x^3 + x} dx$$