

## Tasks for independent decision on the topic "Integral calculus"

variant **1.**

Integrate by Substitution:

$$\int \frac{\sqrt{\ln x}}{x} dx \quad (\text{Substitution: } y = \ln x)$$

Calculate a definite integral:

$$\int_{-1}^0 (-x - x^2) dx$$

variant **2.**

Calculate the integral:

$$\int \frac{dx}{5 + 5x^2}$$

Calculate the area under the curve  $f(x)$ , above the abscissa axis, and between the straight lines  $x = a$ ,  $x = b$ :

$$f(x) = 3x - 2x^2, \quad a = 0, b = 5$$

variant **3.**

Integrate by Substitution:

$$\int \frac{\sin x dx}{\sqrt{3 \cos x}} \quad (\text{Substitution: } y = \cos x)$$

Calculate the area under the curve  $f(x)$ , above the abscissa axis, and between the straight lines  $x = a$ ,  $x = b$ :

$$f(x) = 5x - x^2 - 4, \quad a = 1, b = 6$$

variant **4.**

Integrate by Substitution:

$$\int 2x(x^2 + 1)^5 dx \quad (\text{Substitution: } y = x^2 + 1)$$

Calculate the area under the curve  $f(x)$ , above the abscissa axis, and between the straight lines  $x = a$ ,  $x = b$ :

$$f(x) = x^2 + 4x, \quad a = -4, b = 1$$

variant **5.**

Calculate the integral:

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

Calculate the area under the curve  $f(x)$ , above the abscissa axis, and between the straight lines  $x = a$ ,  $x = b$ :

$$f(x) = 3x - 2x^2 - 1, \quad a = 1, b = 6$$

variant **6.**

Calculate the integral:

$$\int \frac{dx}{\sqrt{9x^2 + 36}}$$

Calculate the area under the curve  $f(x)$ , above the abscissa axis, and between the straight lines  $x = a$ ,  $x = b$ :

$$f(x) = 3 - x^2 - 2x, \quad a = -3, b = 2$$

variant **7.**

Calculate the integral:

$$\int \frac{dx}{\sqrt{9 - x^2}}$$

Calculate the average value of the function  $f(x)$  on the interval  $(a, b)$ :

$$f(x) = 2x^2 - 1, \quad a = 1, b = 6$$

variant **8.**

Calculate the integral:

$$\int \frac{dx}{5 + 5x^2}$$

Calculate the average value of the function  $f(x)$  on the interval  $(a, b)$ :

$$f(x) = 3x - 2x^2 + 8, \quad a = 1, b = 4$$

variant **9.**

Integrate by Substitution:

$$\int x\sqrt{x^2+1}dx \quad (\text{Substitution: } y=x^2+1)$$

Calculate the average value of the function  $f(x)$  on the interval  $(a, b)$ :

$$f(x) = -x^2 + 4, \quad a = -2, b = 3$$

variant **10.**

Calculate the integral:

$$\int \frac{dx}{25-x^2}$$

Calculate the average value of the function  $f(x)$  on the interval  $(a, b)$ :

$$f(x) = 3x - 2x^2 - 1, \quad a = 1, b = 6$$

variant **11.**

Calculate the integral:

$$\int \frac{(\sqrt{x} + 2)^2 dx}{\sqrt{x}}$$

Calculate the average value of the function  $f(x)$  on the interval  $(a, b)$ :

$$f(x) = 2x^2 - x - 6, \quad a = -1,5, b = 3,5$$

variant **12.**

Integrate by Substitution:

$$\int x\sqrt{x^2-4}dx \quad (\text{Substitution: } y=x^2-4)$$

Calculate the average value of the function  $f(x)$  on the interval  $(a, b)$ :

$$f(x) = 2x^2 - 5x - 3, \quad a = -0,5, b = 4,5$$

variant **13.**

Calculate the integral:

$$\int \frac{3-x^2}{4-x^2} dx$$

Calculate a definite integral:

$$\int_{\pi/4}^{\pi/2} \frac{dx}{\sin^2 x}$$

variant **14**.

Calculate the integral:

$$\int \frac{dx}{5 + 5x^2}$$

Calculate the average value of the function  $f(x)$  on the interval  $(a, b)$ :

$$f(x) = 3x - 2x^2 - 1, \quad a = 1, b = 6$$