

задача 1

$$\int \left(x^{\frac{1}{3}} + x^{\frac{1}{4}} \right)^5 dx$$

$$\int \left(x^{\frac{5}{3}} + 5 x^{\frac{4}{3}} x^{\frac{1}{4}} + 10 x^{\frac{3}{3}} x^{\frac{2}{4}} + 10 x^{\frac{2}{3}} x^{\frac{3}{4}} + 5 x^{\frac{1}{3}} x^{\frac{4}{4}} + x^{\frac{5}{4}} \right) dx$$

$$\int \left(x^{\frac{5}{3}} + 5 x^{\frac{19}{12}} + 10 x^{\frac{18}{12}} + 10 x^{\frac{17}{12}} + 5 x^{\frac{16}{12}} + x^{\frac{5}{4}} \right) dx$$

$$\frac{3}{8} x^{\frac{8}{3}} + 5 \frac{12}{31} x^{\frac{31}{12}} + 10 \frac{12}{30} x^{\frac{30}{12}} + 10 \frac{12}{29} x^{\frac{29}{12}} + 5 \frac{12}{28} x^{\frac{28}{12}} + \frac{4}{9} x^{\frac{9}{4}}$$

$$\frac{3}{8} x^{\frac{8}{3}} + \frac{60}{31} x^{\frac{31}{12}} + 4 x^{\frac{30}{12}} + \frac{120}{29} x^{\frac{29}{12}} + \frac{60}{28} x^{\frac{28}{12}} + \frac{4}{9} x^{\frac{9}{4}}$$

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$$1 \times 1$$

$$1 \times 2 \times 1$$

$$1 \times 3 \times 3 \times 1$$

$$1 \times 4 \times 6 \times 4 \times 1$$

$$1 \times 5 \times 10 \times 10 \times 5 \times 1$$

задача 2

$$\ln[27]= \int \frac{x}{\sin[x^2]^2} dx$$

$$\frac{1}{2} \int \frac{1}{\sin[x^2]^2} dx^2$$

$$-\frac{1}{2} \text{Cot}[x^2]$$

котангенс

задача 3

$$\ln[36]= \int (x+1) \text{Cos}[x] dx$$

косинус

$$\int (x+1) d\text{Sin}[x]$$

синус

$$\text{Sin}[x] (x+1) - \int \text{Sin}[x] d(x+1)$$

синус

$$\text{Sin}[x] (x+1) + \text{Cos}[x]$$

косинус

Задача 4

$$\int \frac{x+1}{x^2+x+1} dx$$

$$\int \frac{\left(x + \frac{1}{2}\right) + \frac{1}{2}}{\left(x + \frac{1}{2}\right)^2 + \frac{3}{4}} dx \left(x + \frac{1}{2}\right)$$

$$\frac{1}{2} \int \frac{1}{\left(x + \frac{1}{2}\right)^2 + \frac{3}{4}} dx \left(\left(x + \frac{1}{2}\right)^2 + \frac{3}{4}\right) + \int \frac{\frac{1}{2}}{\left(x + \frac{1}{2}\right)^2 + \frac{3}{4}} dx \left(x + \frac{1}{2}\right)$$

$$\frac{1}{2} \text{Log} \left[\left(x + \frac{1}{2}\right)^2 + \frac{3}{4} \right] + \frac{1}{\sqrt{3}} \text{ArcTan} \left[\frac{2x+1}{\sqrt{3}} \right]$$

[натуральный логарифм]
[арктангенс]

$$\int \frac{\left(x + \frac{1}{2}\right) + \frac{1}{2}}{\left(x + \frac{1}{2}\right)^2 + \frac{3}{4}} dx$$

$$x + \frac{1}{2} = y$$

$$\int \frac{y + \frac{1}{2}}{y^2 + \frac{3}{4}} dy$$

$$\int \frac{y}{y^2 + \frac{3}{4}} dy + \int \frac{\frac{1}{2}}{y^2 + \frac{3}{4}} dy$$

$$\frac{1}{2} \text{Log} \left[y^2 + \frac{3}{4} \right] + \frac{1}{2\sqrt{3}} \text{ArcTan} \left[\frac{2y}{\sqrt{3}} \right]$$

[натуральный логарифм]
[арктангенс]

Задача 5

In[60]:=

$$\int \text{Cos}[8x] \text{Sin}[x] dx$$

[косинус]
[синус]

$$\text{Cos}[8x] \text{Sin}[x] = \frac{1}{2} (\text{Sin}[-7x] + \text{Sin}[9x])$$

[косинус]
[синус]
[синус]
[синус]

$$\frac{1}{2} \int (\text{Sin}[-7x] + \text{Sin}[9x]) dx$$

[синус]
[синус]

$$- \frac{1}{14} \int \text{Sin}[-7x] d(-7x) + \frac{1}{18} \int \text{Sin}[9x] d(9x)$$

[синус]
[синус]

$$\frac{1}{14} \text{Cos}[7x] - \frac{1}{18} \text{Cos}[9x]$$

[косинус]
[косинус]

задача 6

In[66]:=

$$\int_0^{\infty} \text{Sin}[x] e^{-x} dx$$

[синус]

$$\int \underset{\text{[синус]}}{\text{Sin}[x]} e^{-x} dx$$

$$- \int \underset{\text{[синус]}}{\text{Sin}[x]} d e^{-x}$$

$$- \underset{\text{[синус]}}{\text{Sin}[x]} e^{-x} + \int \underset{\text{[косинус]}}{\text{Cos}[x]} e^{-x} dx$$

$$- \underset{\text{[синус]}}{\text{Sin}[x]} e^{-x} - \int \underset{\text{[косинус]}}{\text{Cos}[x]} d e^{-x}$$

$$- \underset{\text{[синус]}}{\text{Sin}[x]} e^{-x} - \underset{\text{[косинус]}}{\text{Cos}[x]} e^{-x} - \int \underset{\text{[синус]}}{\text{Sin}[x]} e^{-x} dx = \int \underset{\text{[синус]}}{\text{Sin}[x]} e^{-x} dx$$

$$- \underset{\text{[синус]}}{\text{Sin}[x]} e^{-x} - \underset{\text{[косинус]}}{\text{Cos}[x]} e^{-x} - A = A$$

$$A = \frac{-1}{2} \left(\underset{\text{[косинус]}}{\text{Cos}[x]} + \underset{\text{[синус]}}{\text{Sin}[x]} \right) e^{-x}$$

$$A[\infty] - A[0] = 0 - \left(\frac{-1}{2} \right) = \frac{1}{2}$$

задача 7

$$\int_0^1 \pi (1-x)^2 dx$$

$$\int \pi (1 - 2x + x^2) dx$$

$$\pi \left(x - x^2 + \frac{x^3}{3} \right)$$

$$\frac{\pi}{3}$$