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Контроль 2.

$$\textcircled{3} A = \int \frac{x^5 dx}{(x-2)^2(x^2-2x+2)}$$

$$(x^2-4x+4)(x^2-2x+2) = x^4 - 6x^3 + 14x^2 - 16x + 8$$

$$x^5 : x^4 - 6x^3 + 14x^2 = 16x + 8$$

$$\begin{array}{r} x^5 - 6x^4 + 14x^3 - 16x^2 + 8x \\ \hline \end{array}$$

$$\begin{array}{r} 6x^4 - 14x^3 + 16x^2 - 8x \\ \hline 6x^4 - 36x^3 + 84x^2 - 96x + 48 \\ \hline \end{array}$$

$$22x^3 - 68x^2 + 88x - 48$$

$$A = \int x+6 + \frac{2(11x^3-34x^2+44x-24)}{(x-2)^2(x^2-2x+2)} dx$$

$$= \int \underbrace{x}_{\frac{x^2}{2}} dx + 6 \int \underbrace{1}_{6x} dx + 2 \int \underbrace{\frac{11x^3-34x^2+44x-24}{(x-2)^2(x^2-2x+2)}}_B dx$$

$$\Rightarrow B = \frac{a}{x-2} + \frac{b}{(x-2)^2} + \frac{c(x+d)}{x^2-2x+2} = a(x-2)(x^2-2x+2) + b(x^2-2x+2) + \frac{(x+d)}{(x-2)^2} =$$

$$= \dots = (a+c)x^3 + (b-4a+d-4c)x^2 + (6a-2b+4c-4d)x + (2b+4d-4a)$$

$$\Rightarrow \begin{cases} x^3: 11 = a + c \Rightarrow a = 11 - c \\ x^2: -4a + b - 4c + d = 34 \\ x: 6a - 2b + 4c - 2d = 44 \\ x^0: -4a + 2b + 4d = 24 \end{cases} \Rightarrow \begin{aligned} & a = 11 - c \\ & -4(11 - c) + b - 4c + d = 34 \Rightarrow -44 + 4c + b - 4c + d = 34 \Rightarrow b + d = 78 \\ & 6(11 - c) - 2b + 4c - 2d = 44 \Rightarrow 66 - 6c - 2b + 4c - 2d = 44 \Rightarrow -2b - 2c - 2d = -22 \Rightarrow b + c + d = 11 \\ & -4(11 - c) + 2b + 4d = 24 \Rightarrow -44 + 4c + 2b + 4d = 24 \Rightarrow 2b + 4c + 4d = 68 \Rightarrow b + 2c + 2d = 34 \end{aligned}$$

~~$d = 68 - 2b$~~

~~$4b + 66 - 6c +$~~

$$\begin{cases} x^3: 11 = a + c & a = 11 - c & a = 12 \quad (1) \\ x^2: -4a + b - 4c + d = 34 & -48 + b + 4 + d = 34 & b = 32 - d \\ x: 6a - 2b + 4c - 2d = 44 & 72 - 2b + 44 - 2d = 44 & 20 - d = 22 \Rightarrow d = -2 \\ x^0: -4a + 2b + 4d = 24 & -48 + 2b - 8 = 24 & 2b = 76 \Rightarrow b = 38 \end{cases}$$

$\hookrightarrow 2a + 4c = 20 \quad a + 2c = 10$
 $c = -1$
 $a = 12$

$$B = \underbrace{\int \frac{12 dx}{x-2}}_C + \underbrace{\int \frac{8 dx}{(x-2)^2}}_D + \underbrace{\int \frac{2-x}{x^2+2x+2} dx}_E$$

$$C = 12 \int \frac{d(x-2)}{x-2} = 12 \ln|x-2| + C - \text{const}$$

$$D = 8 \int \frac{d(x-2)}{(x-2)^2} \quad x-2 = t \Rightarrow 8 \int \frac{dt}{t^2} = \frac{8}{t} + C = \frac{8}{x-2} + C$$

$$E = 2 \int \frac{dx}{x^2+2x+2} - \int \frac{x dx}{x^2+2x+2} =$$

$$= 2 \int \frac{dx-1}{(x-1)^2+1} - \int \frac{(x-1)+1}{(x-1)^2+1} dx = \int \frac{(x-1)dx}{(x-1)^2+1} + \int \frac{dx}{(x-1)^2+1}$$

$\arctg(x-1)$

$$2 \arctg(x-1)$$

$$\boxed{-2}$$

$$\int \frac{u du}{u^2+1} = \int \frac{du}{u^2+1} = \ln|x^2-2x+2| + C$$

$$0+2: A = \frac{x^2}{2} + 6x + \left(12 \ln|x-2| + \frac{8}{x-2} + 2 \operatorname{arctg}(x-1) - \operatorname{arctg}(x-1) + \ln|x^2-2x+2| \right)$$

$$A = \underbrace{\frac{x^2}{2}} + \underbrace{6x + \frac{24 \ln|x-2|}{C} + \frac{16}{x-2}}_{D} + \underbrace{2 \operatorname{arctg}(x-1) + 2 \ln|x^2-2x+2|}_{E}$$

B

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