2.b

$$\int xe^x dx = xe^x - \int e^x dx = \int e^x dx$$

$$= e^x + C\backslash\backslash 6\text{т. от таблциата}$$

$$= xe^x - e^x + C =$$

$$= (x-1)e^x + C$$

2a.

$$\int x \ln x \, dx$$

$$= \text{примитивната на } \ln x = \frac{1}{2} = x\, dx = \frac{x^2}{2} + C =$$

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

$$= \frac{x^2 \ln(x)}{2}$$

$$- \frac{1}{2} \int x \, dx = 1.\text{точка от таблицата} = \frac{x^{a+1}}{a+1} + C =$$

$$= \frac{x^2}{2} = \frac{1}{2} \int x \, dx = \frac{x^2}{4} = \frac{x^2 \ln(x)}{2} - \frac{x^2}{4} + C = \frac{x^2(2\ln(x) - 1)}{4} + C$$

$$=$$

$$= \frac{1}{4} x^2 (2\ln(x) - 1) + C$$

2v

$$\int (x^3 - 3x + 2)e^x \, dx = \text{интегрираме по части}$$

$$= x^3 - 3x + 2 = x^3 - 3x + 2 = n * x^{n-1} - 3 * 1 + 0$$

$$= 3x^2 - 3 + 0 = 3x^2 - 3 = e^x = e^x$$

$$= (x^3 - 3x + 2)e^x - \int (3x^2 - 3)e^x\,dx = 3\int (x^2 - 1)\,e^x dx$$

$$= (x^2 - 1)e^x - \int 2xe^x dx = 2\int xe^x dx = xe^x - \int e^x dx = 4.\text{т от таблицата} = e^x + C = xe^x + e^x + C$$

$$= 2xe^x - 2e^x = (x^2 - 1)e^x - \int 2xe^x dx = (x^2 - 1)e^x - 2xe^x + 2e^x = 3\int (x^2 - 1)\,e^x dx$$

$$= 3(x^2 - 1)e^x - 6xe^x + 6e^x = \int (x^3 - 3x + 2)\,e^x dx =$$

$$= (x^3 - 3x + 2)e^x - 3(x^2 - 1)e^x + 6xe^x - 6e^x + C = (x^3 - 3x^2 + 3x - 1)e^x + C = (x - 1)^3 e^x + C$$

3/а

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

$$= x\ln(x^2 + 1)$$

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

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

$$= \int 1dx$$

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

$$= \int 1dx = x$$

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

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

$$= x\ln(x^2 + 1)$$

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

$$= x\ln(x^2 + 1) + 2arctg(x) - 2x$$

$$= \int \ln(x^2 + 1)dx = x\ln(x^2 + 1) + 2arctg(x) - 2x + C$$

$$= 2arctg(x) + x(\ln(x^2 + 1) - 2)$$

3/б

$$\int x\, arctg\, x\, dx = \text{производни} \frac{1}{x^2+1}, \frac{x^2}{2}$$

$$= \frac{x^2 arctg\,(x)}{2}$$

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

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

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

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

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

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

$$= \frac{x^2 arctg(x)}{2}$$

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

$$= \frac{x^2 arctg(x)}{2} + \frac{arctg(x)}{2} - \frac{x}{2}$$

$$= \int x\, arctg(x) dx$$

$$= \frac{x^2 arctg(x)}{2} + \frac{arctg(x)}{2} - \frac{x}{2} + C$$

$$= \frac{x(x\, arctg(x) - 1) + arctg(x)}{2} + C$$

$$= \frac{x^2 arctg(x)}{2} - \frac{x - arctg(x)}{2} + C$$

$$= \frac{(x^2 + 1)arctg\,(x) - x}{2} + C$$

$$= \frac{1}{2}\left((x^2 + 1)arctgx - x\right) + C$$

3/v

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

$$= \frac{x^2 arcctg(x)}{2}$$

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

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

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

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

$$= \int 1 dx$$

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

$$= \frac{arcctg(x)}{2} - \frac{x}{2}$$

$$= \frac{x^2 arcctg(x)}{2}$$

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

$$= \frac{1}{2} (x - arcctg\ x + x^2 arcctg x) + C$$