Вар 10, задача 3 ①

$$\int_0^{\pi} 3x^2 \sin(2x)\,dx$$

↓

$$3\int_0^{\pi} x^2 \sin(2x)\,dx \qquad \left(\int f\,dg = fg - \int g\,df\right.$$

$$\left. f = x^2,\ dg = \sin(2x)\,dx \right.$$

$$\left. df = 2x\,dx,\ g = -\tfrac{1}{2}\cos(2x)\right)$$

$$\to \left(-\frac{3}{2}x^2\cos(2x)\right)\Big|_0^{\pi} + 3\int_0^{\pi} x\cos(2x)\,dx$$

$$\text{рш}\left(-\frac{3}{2}x^2\cos(2x)\right)\Big|_0^{\pi} = \left(-\frac{3}{2}\pi^2\cos(2\pi)\right) - \left(-\frac{3}{2}\cdot 0^2\cos(2\cdot 0)\right) = -\frac{3\pi^2}{2}$$

$$\to -\frac{3\pi^2}{2} + 3\int_0^{\pi} x\cos(2x)\,dx \qquad \left(f = x;\ dg = \cos(2x)\,dx\right.$$

$$\left. df = dx,\ g = \tfrac{1}{2}\sin(2x)\right)$$

$$\to -\frac{3\pi^2}{2} + \frac{3}{2}x\sin(2x)\Big|_0^{\pi} - \frac{3}{2}\int_0^{\pi}\sin(2x)\,dx$$

$$\text{рш}\ \frac{3}{2}x\sin(2x)\Big|_0^{\pi} = \frac{3}{2}\pi\sin 2\pi - \frac{3}{2}\cdot 0\sin(2\cdot 0) = 0$$

$$\to -\frac{3\pi^2}{2} - \frac{3}{2}\int_0^{\pi}\sin(2x)\,dx$$

→

рш $\int 3\sin(2x)$ $u = 2x$ и $du = 2dx$ ②

$u = 2\cdot 0 = 0$ и $u = 2\pi$

$$\to -\frac{3\pi^2}{2} - \frac{3}{4}\int_0^{2\pi}\sin(u)\,du \to$$

$$\to -\frac{3\pi^2}{2} + \frac{3\cos(u)}{4}\Big|_0^{2\pi}$$

$$\text{рш}\ \frac{3\cos(u)}{4}\Big|_0^{2\pi} = \frac{3}{4}\cos(2\pi) - \frac{3\cos(0)}{4} = 0$$

$$\to -\frac{3\pi^2}{2}$$ } ответ.