

$$① \textcircled{a} \int_2^2 g(x) dx = \boxed{0}$$

$$\textcircled{b} \int_5^1 g(x) dx = -\int_1^5 g(x) dx = \boxed{-8}$$

$$\textcircled{c} \int_1^2 3f(x) dx = 3 \int_1^2 f(x) dx = 3(-4) = \boxed{-12}$$

$$\textcircled{d} \int_2^5 f(x) dx = \int_1^5 f(x) dx - \int_1^2 f(x) dx \\ = 6 - (-4) = \boxed{10}$$

$$\textcircled{e} \int_1^5 [f(x) - g(x)] dx = \int_1^5 f(x) dx - \int_1^5 g(x) dx \\ = 6 - 8 = \boxed{-2}$$

$$\textcircled{f} \int_1^5 [4f(x) - g(x)] dx = 4 \int_1^5 f(x) dx - \int_1^5 g(x) dx \\ = 4(6) - 8 \\ = \boxed{16}$$

$$\textcircled{4} \int_{-3}^0 g(t) dt = \sqrt{2}$$

$$\textcircled{a} \int_0^{-3} g(t) dt = \boxed{-\sqrt{2}}$$

$$\textcircled{b} \int_{-3}^0 g(u) du = \boxed{\sqrt{2}}$$

$$\textcircled{c} \int_{-3}^0 [-g(x)] dx = \boxed{-\sqrt{2}}$$

$$\textcircled{d} \int_{-3}^0 \frac{g(r)}{\sqrt{2}} dr = \frac{\sqrt{2}}{\sqrt{2}} = \boxed{1}$$

$$\textcircled{6} \int_{-1}^1 h(r) dr = 0 \quad \int_{-1}^3 h(r) dr = 6$$

$$\textcircled{a} \int_1^3 h(r) dr = \int_{-1}^3 h(r) dr - \int_{-1}^1 h(r) dr \\ = 6 - 0 = \boxed{6}$$

$$\textcircled{b} \int_3^1 h(u) du = -(-6) = \boxed{6}$$

$$\textcircled{20} \int_0^{\frac{\pi}{2}} \cos x dx = \sin\left(\frac{\pi}{2}\right) - \sin 0 = 1 - 0 = \boxed{1}$$

$$\textcircled{21} \int_0^1 e^x dx = e^1 - e^0 = \boxed{e-1}$$

$$\textcircled{22} \int_0^{\frac{\pi}{4}} \sec^2 x dx = \tan\left(\frac{\pi}{4}\right) - \tan 0 = 1 - 0 = \boxed{1}$$

$$\textcircled{23} \int^4 2x dx = x^2 \Big|_1^4 = (4)^2 - 1^2 = 16 - 1 = \boxed{15}$$

$$\textcircled{24} \int_{-1}^2 3x^2 dx = \frac{3}{3} x^3 \Big|_{-1}^2 = x^3 \Big|_{-1}^2 = (2)^3 - (-1)^3 = 8 + 1 = \boxed{9}$$

$$\textcircled{25} \int_{-2}^6 5 dx = 5x \Big|_{-2}^6 = 5(6) - 5(-2) = 30 + 10 = \boxed{40}$$

$$\textcircled{26} \int_3^7 8 dx = 8x \Big|_3^7 = 8(7) - 8(3) = 56 - 24 = \boxed{32}$$

$$\textcircled{29} \int_1^e \frac{1}{x} dx = \ln x \Big|_1^e = \ln e - \ln 1 = 1 - 0 = \boxed{1}$$