

## Definite Integrals Practice

$$(5) \int_0^1 2x dx = \frac{2x^2}{2} = x^2 \Big|_0^1 = (1)^2 - (0)^2 = \boxed{1}$$

$$(7) \int_1^0 (x-2) dx = \frac{x^2}{2} - 2x \Big|_1^0 \Rightarrow \left( \frac{0^2}{2} - 2(0) \right) - \left( \frac{(-1)^2}{2} - 2(-1) \right) = (0) - \left( \frac{1}{2} + 2 \right) = \boxed{-\frac{5}{2}}$$

$$(9) \int_{-1}^1 (t^2 - 2) dt \Rightarrow \frac{t^3}{3} - 2t \Big|_{-1}^1 \Rightarrow \left( \frac{1^3}{3} - 2(1) \right) - \left( \frac{(-1)^3}{3} - 2(-1) \right) \Rightarrow -\frac{5}{3} - \frac{5}{3} = \boxed{-\frac{10}{3}}$$

$$(11) \int_0^1 (2t-1)^2 dt \Rightarrow \int_0^1 (4t^2 - 4t + 1) dt = \frac{4t^3}{3} - \frac{4t^2}{2} + t \Big|_0^1$$

$$\Rightarrow \left( \frac{4(1)^3}{3} - \frac{4(1)^2}{2} + 1 \right) - \left( \frac{4(0)^3}{3} - \frac{4(0)^2}{2} + 0 \right)$$

$$\Rightarrow \left( \frac{4}{3} - 2 + 1 \right) - 0 \Rightarrow \boxed{\frac{1}{3}}$$

$$(13) \int_1^2 \left( \frac{3}{x^2} - 1 \right) dx = \int_1^2 (3x^{-2} - 1) dx = \frac{3x^{-1}}{-1} - x \Big|_1^2 \Rightarrow \left. \frac{-3}{x} - x \right|_1^2$$

$$\left( \frac{-3}{2} - 2 \right) - \left( \frac{-3}{1} - 1 \right) \Rightarrow$$

$$\left( -\frac{7}{2} \right) - (-4) = \boxed{\frac{1}{2}}$$

$$(15) \int_1^4 \frac{u-2}{\sqrt{u}} du \Rightarrow \int_1^4 (u-2)u^{-1/2} du \Rightarrow \int_1^4 (u^{1/2} - 2u^{-1/2}) du = \frac{u^{3/2}}{3/2} - \frac{2u^{1/2}}{1/2}$$

$$= \left. \frac{2}{3} u^{3/2} - 4u^{1/2} \right|_1^4 \Rightarrow \left( \frac{2}{3}(4)^{3/2} - 4(4)^{1/2} \right) - \left( \frac{2}{3}(1)^{3/2} - 4(1)^{1/2} \right)$$

$$\Rightarrow \left( \frac{16}{3} - 8 \right) - \left( \frac{2}{3} - 4 \right) = \boxed{\frac{7}{3}}$$

$$(17) \int_{-1}^1 (\sqrt[3]{t} - 2) dt \Rightarrow \int_{-1}^1 (t^{1/3} - 2) dt \Rightarrow \frac{t^{4/3}}{4/3} - 2t \Big|_{-1}^1 \Rightarrow \frac{3}{4} t^{4/3} - 2t \Big|_{-1}^1$$

$$\Rightarrow \left( \frac{3}{4}(1)^{4/3} - 2(1) \right) - \left( \frac{3}{4}(-1)^{4/3} - 2(-1) \right) \Rightarrow \left( \frac{3}{4} \right) - \left( \frac{11}{4} \right) = \boxed{-4}$$

$$(19) \int_0^1 \frac{x - \sqrt{x}}{3} dx \Rightarrow \int_0^1 \left( \frac{1}{3}x - \frac{1}{3}x^{1/2} \right) dx \Rightarrow \frac{1}{3} \frac{x^2}{2} - \frac{1}{3} \frac{x^{3/2}}{3/2}$$

$$\Rightarrow \frac{1}{6}x^2 - \frac{2}{9}x^{3/2} \Big|_0^1 \Rightarrow \left( \frac{1}{6}(1)^2 - \frac{2}{9}(1)^{3/2} \right) - \left( \frac{1}{6}(0)^2 - \frac{2}{9}(0)^{3/2} \right)$$

$$\Rightarrow \left( \frac{1}{6} - \frac{2}{9} \right) - 0$$

$$\Rightarrow \boxed{-\frac{1}{18}}$$

$$(21) \int_{-1}^0 (t^{4/3} - t^{2/3}) dt \Rightarrow \frac{t^{7/3}}{7/3} - \frac{t^{5/3}}{5/3} \Rightarrow \frac{3}{4}t^{4/3} - \frac{3}{5}t^{5/3} \Big|_{-1}^0$$

$$\left( \frac{3}{4}(0)^{4/3} - \frac{3}{5}(0)^{5/3} \right) - \left( \frac{3}{4}(-1)^{4/3} - \frac{3}{5}(-1)^{5/3} \right) \Rightarrow 0 - \left( \frac{3}{4} + \frac{3}{5} \right)$$

$$= \boxed{-\frac{27}{20}}$$

$$(23) \int_0^3 |2x-3| dx \quad \begin{array}{l} 2x-3=0 \\ x=3/2 \end{array} \quad \int_0^{3/2} (-2x+3) dx + \int_{3/2}^3 (2x-3) dx$$

$$-\frac{2x^2}{2} + 3x \Big|_0^{3/2} + \frac{2x^2}{2} - 3x \Big|_{3/2}^3$$

$$\left( -\left(\frac{3}{2}\right)^2 + 3\left(\frac{3}{2}\right) \right) - \left( -(0)^2 + 3(0) \right) + \left( (3)^2 - 3(3) \right) - \left( \left(\frac{3}{2}\right)^2 - 3\left(\frac{3}{2}\right) \right)$$

$$\left( -\frac{9}{4} + \frac{9}{2} \right) - 0 + (9-9) - \left( \frac{9}{4} - \frac{9}{2} \right)$$

$$\frac{9}{4} - 0 + 0 - \left( -\frac{9}{4} \right) \Rightarrow \boxed{\frac{9}{2}}$$