

4.4 Fundamental Theorem of Calculus Part I

★ FTC Part I:

If f is continuous on $[a, b]$ and F is the antiderivative of f on $[a, b]$, then

$$\int_a^b f(x) dx = F(b) - F(a)$$

Examples:

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

$$= \frac{x^2}{2} + \frac{x^{-1}}{1} = \frac{x^2}{2} + \frac{1}{x} \Big|_{-2}^{-1}$$

$$= \left[\frac{(-1)^2}{2} + \frac{1}{-1} \right] - \left[\frac{(-2)^2}{2} + \frac{1}{-2} \right]$$

$$= \left[\frac{1}{2} - 1 \right] - \left[2 - \frac{1}{2} \right]$$

$$-\frac{1}{2} - \frac{3}{2} = \boxed{-2}$$