

FTC II

$$1. \int_2^{\sqrt{x}} \frac{dt}{t} = \int_2^{\sqrt{x}} \frac{1}{t} dt = [\ln|t|]_2^{\sqrt{x}} = \ln\sqrt{x} - \ln 2$$

$$2. \frac{d}{ds} \int_{-2}^5 \tan\left(\frac{1}{1+u^2}\right) du = \tan\left(\frac{1}{1+s^2}\right)$$

$$3. f(x) = \frac{x+1}{x^2+9}, F(7) = 0 \rightarrow F(x) = \int_7^x \frac{t+1}{t^2+9} dt$$

$$4. \frac{d}{dx} \int_1^{\frac{1}{x}} \cos^3 t dt = \cos^3\left(\frac{1}{x}\right) \cdot \frac{d}{dx}\left(\frac{1}{x}\right) \\ = \cos^3\left(\frac{1}{x}\right) \left(-\frac{1}{x^2}\right) = \frac{-\cos^3\left(\frac{1}{x}\right)}{x^2}$$

$$5. \frac{d}{du} \int_{-u}^{3u} \sqrt{x^2+1} dx = \sqrt{(3u)^2+1} \cdot \frac{d}{du}(3u) - \sqrt{(-u)^2+1} \cdot \frac{d}{du}(-u) \\ = 3\sqrt{9u^2+1} + \sqrt{u^2+1}$$