

§5.5

$$\int_0^3 x \sqrt{x+1} dx = \int_1^4 (u-1) \sqrt{u} du = \int_1^4 u^{3/2} - u^{1/2} du$$

$$u = x+1 \leftrightarrow x = u-1$$

$$du = dx$$

$$x=0 \Rightarrow u=1$$

$$x=3 \Rightarrow u=4$$

$$= \left. \frac{2}{5} u^{5/2} - \frac{2}{3} u^{3/2} \right|_1^4$$

$$= \left[\frac{2}{5} (4)^{5/2} - \frac{2}{3} (4)^{3/2} \right] - \left[\frac{2}{5} - \frac{2}{3} \right]$$

$$= \left[\frac{2}{5} (32) - \frac{2}{3} (8) \right] - \left[\frac{2}{5} - \frac{2}{3} \right]$$

$$= \frac{64}{5} - \frac{16}{3} - \frac{2}{5} + \frac{2}{3} = \frac{62}{5} - \frac{14}{3} = \frac{186-70}{15}$$

$$= \frac{116}{15}$$

$$\int \frac{x}{x+3} dx = \int \frac{u-3}{u} du$$

$$u = x+3$$

$$du = dx$$

$$x = u-3$$

$$= \int 1 - \frac{3}{u} du$$

$$= u - 3 \ln|u| + C$$

$$= (x+3) - 3 \ln|x+3| + C$$

$$= x+3 - 3 \ln|x+3| + C$$

$$= x - 3 \ln|x+3| + C$$