

$$\underline{3} \quad \int x \sqrt[3]{x+3} dx \quad \text{Let } u = x+3 \quad x = u-3$$

$$du = dx$$

$$= \int (u-3) \sqrt[3]{u} du$$

$$= \int (u \sqrt[3]{u} - 3 \sqrt[3]{u}) du$$

$$= \int u^{4/3} du - 3 \int u^{1/3} du$$

$$= \frac{u^{7/3}}{7/3} - 3 \frac{u^{4/3}}{4/3} + C$$

$$= \frac{3}{7} (x+3)^{7/3} - \frac{9}{4} (x+3)^{4/3} + C$$

$$\underline{4} \quad \text{Average value} = \frac{1}{2-1} \int_1^2 e^{x/3} dx$$

$$= \frac{e^{x/3}}{1/3} \Big|_1^2$$

$$= 3 e^{x/3} \Big|_1^2$$

$$= 3 [e^{2/3} - e^{1/3}]$$

$$\underline{5} \quad \text{Average value} = \frac{1}{8-0} \int_0^8 \sqrt{x+1} dx$$

$$= \frac{1}{8} \int_0^9 \sqrt{u} du$$

$$= \frac{1}{8} \frac{u^{3/2}}{3/2} \Big|_0^9$$

$$= \frac{1}{12} u^{3/2} \Big|_0^9 = \frac{1}{12} [9^{3/2} - 0^{3/2}] = \frac{1}{12} [27 - 0]$$

$$= \frac{27}{12} = \frac{9}{4}$$

$$\text{Let } u = x+1 \quad du = dx$$

$$\text{When } x=0, u=1$$

$$x=8, u=9$$

$$\frac{13}{6}$$