

$$21. \int_0^2 \frac{x}{\sqrt{3+4x^2}} dx$$

$$u = \underline{3+4x^2} \quad du = \underline{8x} \underline{dx}$$

$$= \frac{1}{8} \int_0^2 \frac{\underline{8x}}{\sqrt{3+4x^2}} \underline{dx}$$

$$= \frac{1}{8} \int_{x=0}^{x=2} \frac{1}{\sqrt{u}} du \cdot$$

$$= \frac{1}{8} \int_{x=0}^{x=2} \frac{1}{u^{\frac{1}{2}}} du$$

$$= \frac{1}{8} \int_{x=0}^{x=2} u^{-\frac{1}{2}} du$$

$$= \frac{1}{8} \left[\frac{u^{-\frac{1}{2}+1}}{-\frac{1}{2}+1} \right]_{x=0}^{x=2}$$

$$= \frac{1}{8} \left[\frac{u^{\frac{1}{2}}}{\frac{1}{2}} \right]_{x=0}^{x=2}$$

$$= \frac{1}{8} \cdot \frac{2}{1} \left[\sqrt{u} \right]_{x=0}^{x=2}$$

$$= \frac{1}{4} \left[\sqrt{3+4x^2} \right]_{x=0}^{x=2}$$

$$= \frac{1}{4} \left[\sqrt{3+4(2)^2} - \sqrt{3+4(0)^2} \right]$$

$$= \frac{1}{4} (\sqrt{19} - \sqrt{3})$$

$$\begin{array}{l} x=0 \\ u=3+4x^2 \\ u=3+4(0)^2 \\ u=3 \end{array}$$

$$\begin{array}{l} u=19 \\ u=3 \end{array}$$

$$\frac{1}{8} \int_{u=3}^{u=19} \frac{1}{\sqrt{u}} du$$

$$\begin{array}{l} x=2 \\ u=3+4x^2 \\ u=3+4(2)^2 \\ u=19 \end{array}$$

$$\begin{array}{l} u=19 \\ u=3 \end{array}$$