



Differentials Errors and Approximation Ex14.1 Q9(xviii)

$$\begin{aligned}\text{Let } x &= 25, \quad x + \Delta x = 26 \\ \Delta x &= 26 - 25 \\ &= 1\end{aligned}$$

$$\begin{aligned}\text{Let } y &= \sqrt{x} \\ \frac{dy}{dx} &= \frac{1}{2\sqrt{x}} \\ \left(\frac{dy}{dx}\right)_{x=25} &= \frac{1}{2\sqrt{25}} \\ &= \frac{1}{10} \\ &= 0.1\end{aligned}$$

$$\begin{aligned}\Delta y &= \left(\frac{dy}{dx}\right)_{x=25} \times (\Delta x) \\ &= (0.1)(1) \\ &= 0.1\end{aligned}$$

$$\begin{aligned}\sqrt{26} &= y + \Delta y \\ &= \sqrt{x} + 0.01 \\ &= \sqrt{25} + 0.1\end{aligned}$$

$$\sqrt{26} = 5.1$$

$$\begin{aligned}\text{Let } x &= 0.49, \quad x + \Delta x = 0.487 \\ \Delta x &= 0.48 - 0.49 \\ &= -0.01\end{aligned}$$

$$\begin{aligned}\text{Let } y &= \sqrt{x} \\ \frac{dy}{dx} &= \frac{1}{2\sqrt{x}} \\ \left(\frac{dy}{dx}\right)_{x=0.49} &= \frac{1}{2\sqrt{0.49}} \\ &= \frac{1}{1.4} \\ &= 0.71428\end{aligned}$$

$$\begin{aligned}\Delta y &= \left(\frac{dy}{dx}\right)_{x=0.49} \times (\Delta x) \\ &= (0.71428)(-0.01) \\ \Delta y &= -0.0071428\end{aligned}$$

$$\begin{aligned}\sqrt{0.48} &= y + \Delta y \\ &= \sqrt{0.49} - 0.0071428 \\ &= 0.7 - 0.0071428\end{aligned}$$

$$\sqrt{0.48} = 0.6928572$$

$$\begin{aligned}\text{Let } x &= 81, \quad x + \Delta x = 82 \\ \Delta x &= 82 - 81 \\ &= 1\end{aligned}$$

$$\begin{aligned}\text{Let } y &= x^{\frac{1}{4}} \\ \frac{dy}{dx} &= \frac{1}{4x^{\frac{3}{4}}} \\ \left(\frac{dy}{dx}\right)_{x=81} &= \frac{1}{4(81)^{\frac{3}{4}}} \\ &= \frac{1}{108} \\ &= 0.009259\end{aligned}$$

$$\begin{aligned}\Delta y &= \left(\frac{dy}{dx}\right)_{x=81} \times (\Delta x) \\ &= (0.009259)(1) \\ &= 0.009259\end{aligned}$$

$$\begin{aligned}(82)^{\frac{1}{4}} &= y + \Delta y \\ &= x^{\frac{1}{4}} + 0.009259 \\ &= (81)^{\frac{1}{4}} + 0.009259\end{aligned}$$

$$(82)^{\frac{1}{4}} = 3.009259$$

*****END*****