Approximation 1 - FORWARD DIFFERENCES (FD)

-> Take the slope between \( P_i \) and \( P_{i+1} \) as being approximately \( \frac{dp}{dx} \) at \( x_i \) to get:

\[
\left( \frac{dp}{dx} \right)_{FD} = \frac{P_{i+1} - P_i}{\Delta x}
\]

Approximation 2 - BACKWARD DIFFERENCES (BD)

-> Take the slope between \( P_{i-1} \) and \( P_i \) as being approximately \( \frac{dp}{dx} \) at \( x_i \) to obtain:

\[
\left( \frac{dp}{dx} \right)_{BD} = \frac{P_i - P_{i-1}}{\Delta x}
\]

Approximation 3 - CENTRAL DIFFERENCES (CD)

-> Average the forward difference and the backward difference to give \( \frac{dp}{dx} \) at \( x_i \):

\[
\left( \frac{dp}{dx} \right)_{CD} = \frac{1}{2} \left[ \left( \frac{dp}{dx} \right)_{FD} + \left( \frac{dp}{dx} \right)_{BD} \right] = \frac{1}{2} \left[ \frac{P_{i+1} - P_i}{\Delta x} + \frac{P_i - P_{i-1}}{\Delta x} \right] = \frac{P_{i+1} - P_{i-1}}{2 \Delta x}
\]