CDS INTERPOLATION: ASSESSMENT

1- **Conservativeness**
Already established in handout 4.4

2- **Boundedness**

a) **Sign of coefficients**
In handout 4.3, we have established that the discretized equation using CDS has the following form:

\[ a_p \phi_p = a_w \phi_w + a_E \phi_E + S_a \]

where:

\[ a_w = D_w + \frac{F_w}{2} \]
\[ a_E = D_e - \frac{F_e}{2} \]
\[ a_p = a_w + a_e + (F_e - F_w) \]

Since a requirement for boundedness is to have all coefficients positive, the only potentially problematic coefficient is \( a_E = D_e - \frac{F_e}{2} \).

Requirement for \( a_E > 0 \):

In the example of handout 4.3: \( \rho u = 2.5 \) and \( \Gamma / \delta x = 0.5 \) \( \Rightarrow Pe = \)

b) **Scarborough criterion**
Let’s examine the Scarborough criterion in the case \( Pe < 2 \) (i.e., positive coefficients).

For a steady 1-D flow, continuity is expressed as: \( \frac{\partial (\rho u)}{\partial x} = 0 \).

In discretized form:

Therefore:

\[ a_p = \]

And

\[ \sum |a_{ul}| \]
\[ |a_p| = \]
3- **Transportiveness**

Convective flux at node $P$:

Diffusive flux at node $P$: 