\[ A_0(x) = \begin{bmatrix} N_1(x) & N_2(x) \end{bmatrix} \begin{bmatrix} A_{c_1} \\ A_{c_2} \end{bmatrix} \]

\[ A_c(x) = N_1(x) A_{c_1} + N_2(x) A_{c_2} \]

\[ = \text{Scalar} \]

\[ \int_0^L \frac{\partial A_s(x)}{\partial x} \theta N_1 \, dx = \text{weight} \]

\[ \int_0^L \frac{\partial}{\partial x} \begin{bmatrix} A_{s_1} \\ A_{s_2} \end{bmatrix} \begin{bmatrix} N_1 \\ N_2 \end{bmatrix} \, dx \]

\[ = \text{Scalar} \]

\[ N_1(x) = 1 - \frac{x}{le} \quad \frac{\partial N_1}{\partial x} = -\frac{1}{le} \]

\[ N_2(x) = \frac{x}{le} \quad \frac{\partial N_2}{\partial x} = \frac{1}{le} \]

\[ -\frac{\partial}{\partial x} \left( \frac{A_{s_2} - A_{s_1}}{le} \right) \begin{bmatrix} N_1 N_1 & N_1 N_2 \\ N_2 N_1 & N_2 N_2 \end{bmatrix} \, dx \]

\[ = \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} \]

\[ \begin{bmatrix} 2 \times 2 \\ 2 \times 1 \end{bmatrix} \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} \]

Homework for today:

1. Get account on Unix system
2. Isoparametric elements by MATLAB
Connect matrix:
\[
\begin{bmatrix}
4 & 5 & 2 & 1 \\
5 & 6 & 3 & 2 \\
7 & 8 & 6 & 5 \\
\end{bmatrix}
\]

Assemble \(8 \times 8\) system:
\[
\begin{bmatrix} A_{8 \times 8} \end{bmatrix} \begin{bmatrix} x \end{bmatrix}_{8 \times 1} = \begin{bmatrix} \text{rhs} \end{bmatrix}_{8 \times 1}
\]

Homework: Wed 20th
MathLab? Isoparametric element

Today FIDAP program

Fluid Dynamics Analysis Package

Company: Fluid Dynamics Inc.
Chicago

Bought by Fluent, Inc.
Lebanon, N.H.
FIDAP:
Run as
```
$ FIDAP -id ident -gui
```

6 char limit forms name for many files FIDAP makes

- **Ident.FDBASE** - binary file contains all the info for the problem
- **Ident.FIJOUR** - journal file has record of all commands in ASCII format

---

**Simple example**

```
\begin{tikzpicture}
  \node (1) at (0,0) {1};
  \node (2) at (1,1) {2};
  \node (3) at (1,0) {3};
  \node (4) at (0,-1) {4};
  \draw (1) -- (2) node [above] {T1};
  \draw (2) -- (3) node [above] {T2};
  \draw (3) -- (4) node [right] {9.1};
  \draw (4) -- (1) node [below] {1.5m};
  \draw ([yshift=-0.5cm]1.south) -- ([yshift=-0.5cm]4.south) node [right] {0.5m};
\end{tikzpicture}
```

FIDAP: **FI-GEN** geometry definition
(also can use other preprocessors, e.g. GAMBIT)
FIGEN
- define points
- define lines
- mesh edges
- mesh