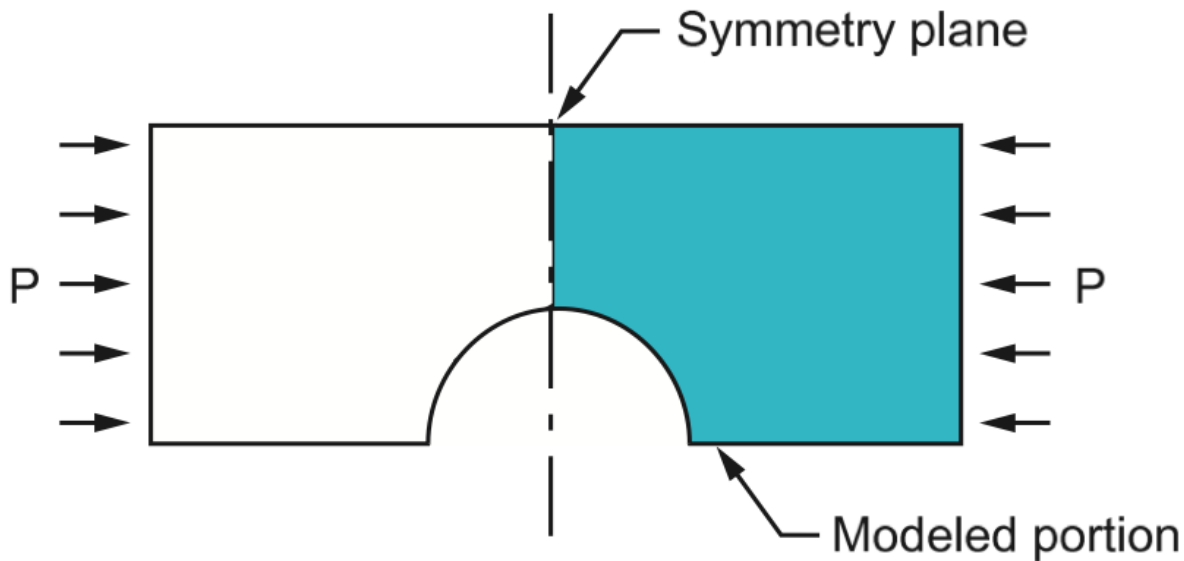**ANSYS Mechanical APDL**
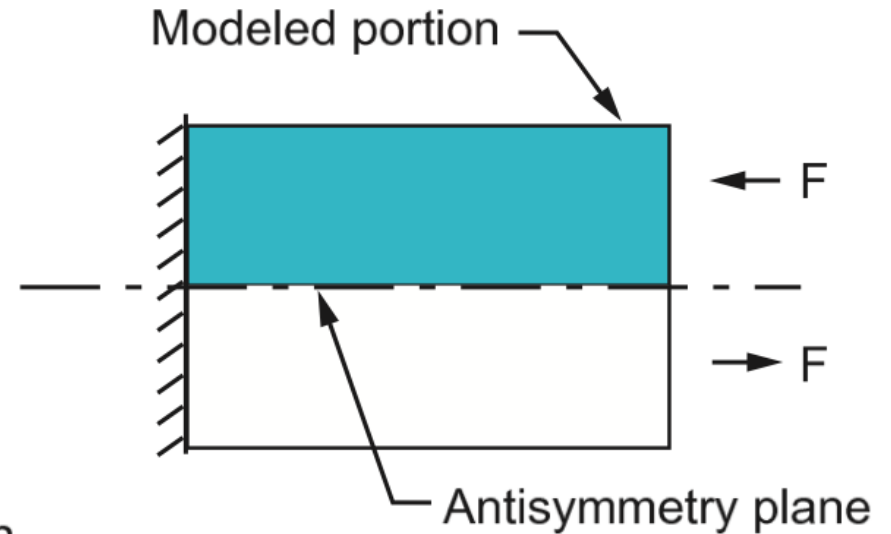# Loads & Boundary Conditions

Topics

- Steps & Substeps
- Rôle of Time Variable
- Stepping & Ramping
- Applying Loads
  - Solid-Model Loads
  - Finite-Element Loads
  - Order of Operations

- Load Types
  - Symmetry
  - Surface
    - Beams, Gradients, Surface Els
  - Body
  - Inertia
  - Coupled-Field
  - Tabular, Functional

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Symmetry Loads

(a) 2-D plate model with symmetry

(b) 2-D plate model with antisymmetry

Surface Loads

| Discipline	Surface Load	Label
Structural	Pressure	PRES[1]
Thermal	Convection Heat Flux Infinite Surface	CONV HFLUX INF
Magnetic	Maxwell Surface Infinite Surface	MXWF INF
Electric	Maxwell Surface Surface Charge Density Infinite Surface	MXWF CHRGS INF
Fluid	Fluid-Structure Interface Impedance	FSI IMPD
All	Superelement Load Vector	SELV
Diffusion	Diffusion Load	DFLUX
Acoustic	FSI IMPD SHLD MXWF FREE INF PORT ATTN BLI	fluid-structure interaction flag impedance or admittance coefficient surface normal velocity or acceleration Maxwell surface flag or equivalent source surface free surface flag exterior Robin radiation boundary flag Port number Absorption coefficient Viscous-thermal boundary layer surface flag

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Body Loads

| Discipline	Body Load	Label
Structural	Temperature Frequency Fluence	TEMP[1] FREQ2 FLUE
Thermal	Heat Generation Rate	HGEN
Magnetic	Temperature Current Density Virtual Displacement Voltage Drop	TEMP[1] JS MVDI VLTG
Electric	Temperature Volume Charge Density	TEMP[1] CHRGD
Diffusion	Diffusing Substance Generation Rate	DGEN
Acoustic	JS IMPD CHRGD TEMP VELO	Mass source or mass source rate Impedance sheet Static pressure Temperature Velocity or acceleration

Data Representations
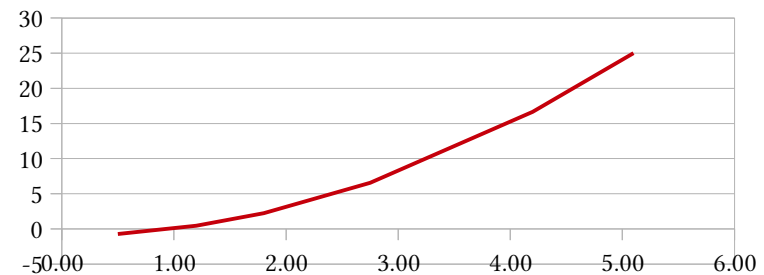
Function
continuous calculation across domain
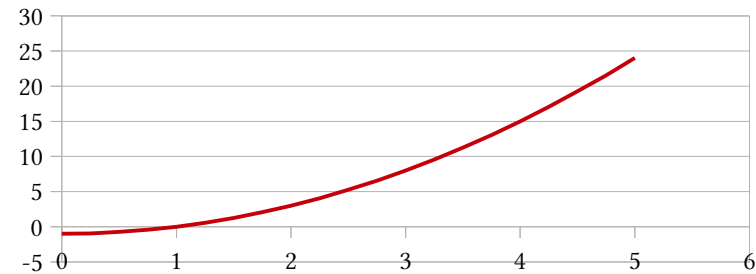
Array
discrete integer-numbered values
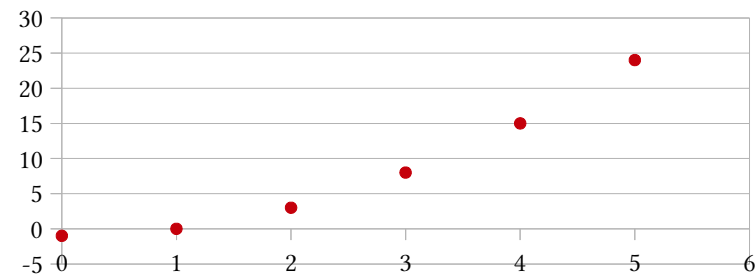
Table
linear interpolation between real values

Bracket Constraint Example

Keypoints
0.00   0.00
0.00   100.00
4.00   100.00
30.00 4.00
30.00 0.00

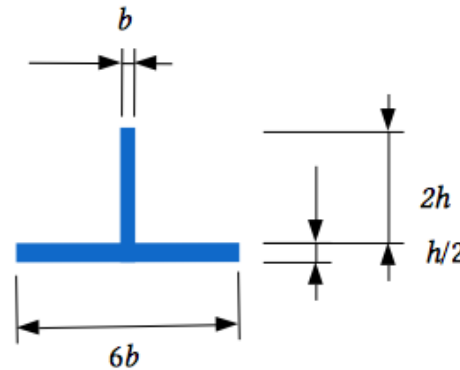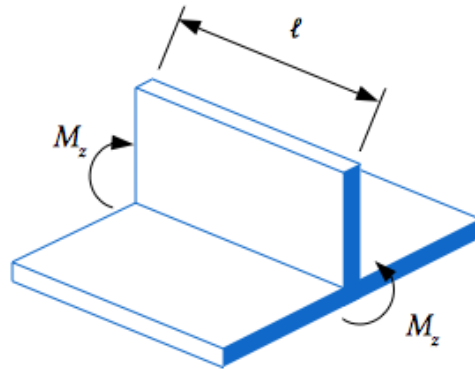**Material**
E   207
NU   0.295
DENS   7.83e-6

Forces
FY   -10

nlgeom,on

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Bending Moment Example

Find the maximum tensile and compressive bending stresses in an asymmetric T beam subject to uniform bending M_z. Visualize the entire SEQV output.

BEAM189
$\ell = 100''$
$b = 1.5''$
$h = 8''$
$M_z = 1 \times 10^5$ in-lb$_f$
$E = 3 \times 10^7$ psi

The reference solution is $\sigma_{BEND,Bot} = 300$ psi; $\sigma_{BEND,Top} = -700$ psi.

User-Defined BCs Example

$$q'' = h(T_{\mathrm{s}} - T_\infty)$$

$$T = 25 \ °\mathrm{C}$$

$$h(x) = \begin{cases} 0.332 \frac{k_{xx}}{x} \mathrm{Re}^{1/2}\mathrm{Pr}^{1/3} & : 1 \leq x < 5 \\ 0.566 \frac{k_{xx}}{x} \mathrm{Re}^{1/2}\mathrm{Pr}^{1/3} & : 5 \leq x \leq 10 \end{cases}$$