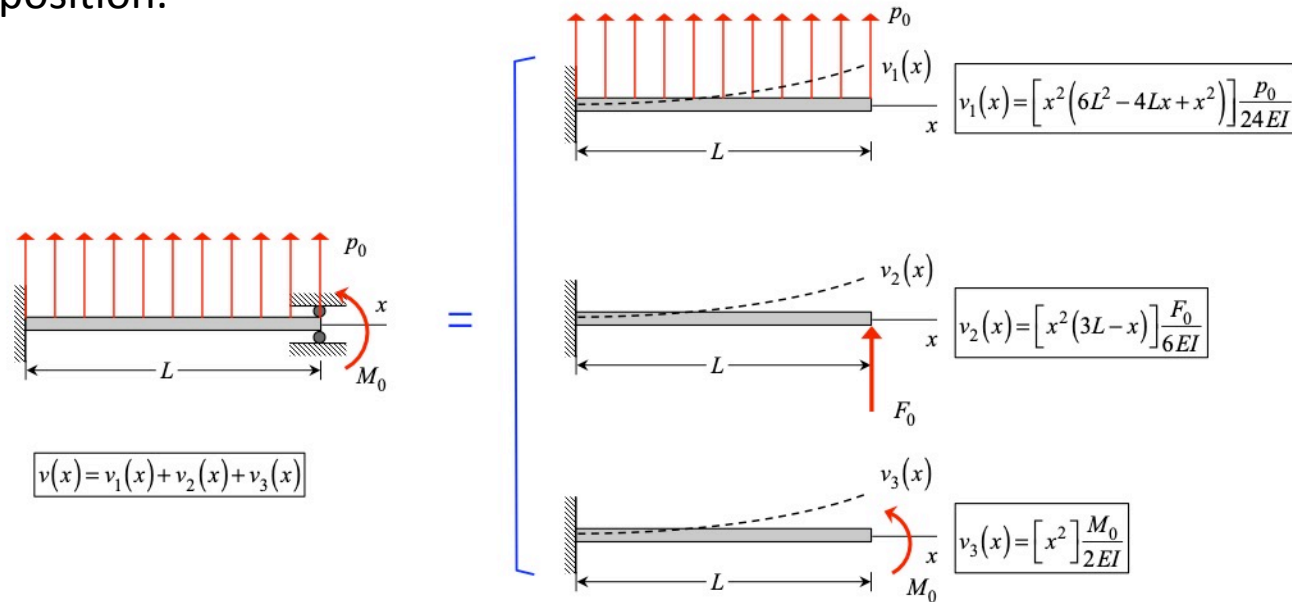# *Summary*: Beam deflection by superposition (indeterminate)

GOAL: Break down complicated loading on a beam into simple loading components and used published deflection formulas to determine the beam deflection through linear superposition.

EXAMPLE:

$$v(x) = v_1(x) + v_2(x) + v_3(x)$$

$$v_1(x) = \left[x^2 \left(6L^2 - 4Lx + x^2 \right) \right] \frac{P_0}{24EI}$$

$$v_2(x) = \left[x^2 \left(3L - x \right) \right] \frac{F_0}{6EI}$$

$$v_3(x) = \left[x^2 \right] \frac{M_0}{2EI}$$

METHOD
- Each component system must be in equilibrium.
- For piece-wise defined loadings and intermediate supports, the superposed solutions must be written in a piece-wise way.
- The components chosen are not unique; there are typically many ways to solve.
- For the above <u>indeterminate</u> beam, the reaction force *F₀* is found by setting *v(L) = 0*.