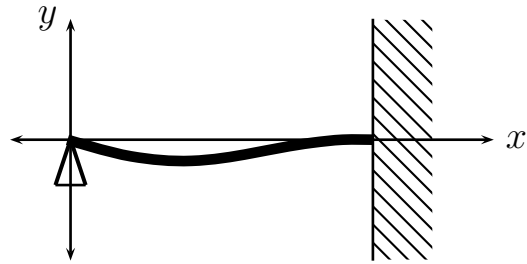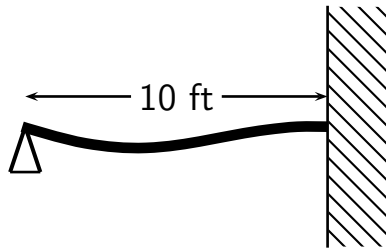1. A ten foot horizontal beam is simply supported at its left end, and embedded at its right end, as shown to the left below. Give the boundary values for the beam.

2. Let L be the differential operator defined on a function $y = y(x)$ by

$$L(y) = (x^2 - 1)\frac{d^2y}{dx^2} + 2x\frac{dy}{dx}.$$

Apply this operator to the functions $p(x) = x^2 - 5x + 2$ and $q(x) = 5x^3 - 3x$.

Eigenfunctions and Eigenvalues

Let A be an operator that operates on functions and let y be a *nonzero* function for which there is a constant λ such that

$$Ay = \lambda y.$$

Then y is an **eigenfunction** of the operator A, with corresponding **eigenvalue** λ. Note that $\lambda = 0$ is allowable, but $y = 0$ is not.