**Lesson #17:   Separation of Variables**
          (Cartesian Coordinates)   **Name:** _____

Study section 3.3.1 and answer the following questions:

1. Show by direct integration that the functions $\sin(x)$ and $\sin(2x)$ are orthogonal on the interval $(0, \pi)$.
    Hint: the integration is easy if you use the double-angle formula $\sin(2x) = 2\sin(x)\cos(x)$.

2. As a slight modification of the in-class example for Lesson 16, find the
    separable solutions $V(x, y)$ for the region $(y < 0, 0 < x < b)$. Apply the
    given boundary conditions such that you are left with only one
    undetermined coefficient. (That is, you need not apply the boundary
    condition at $y = 0$).
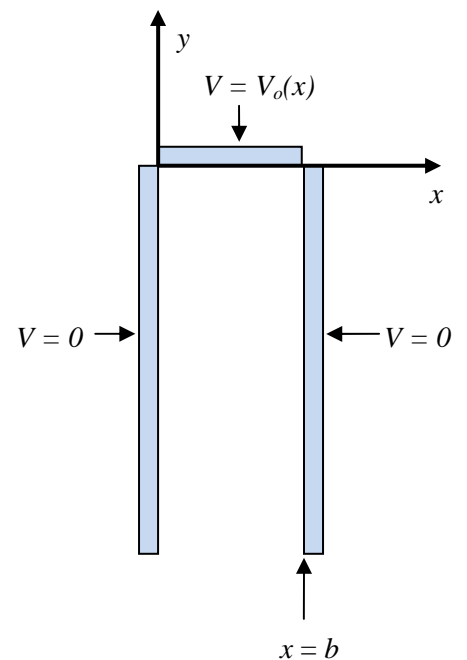
3. In example 3.4, explain how the symmetry of the potential arrangement leads to the hyperbolic cosine
    function as part of the solution.