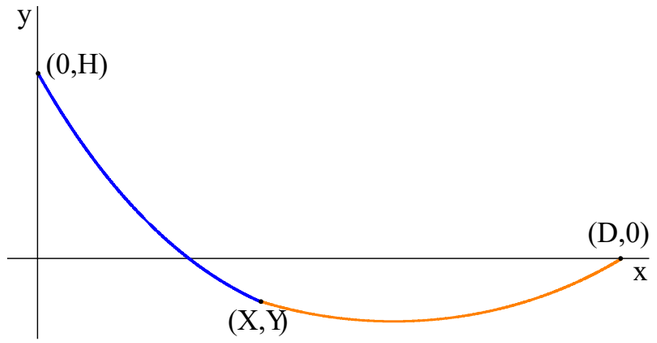
4. Add a stationary rider

Now consider the case where we do have a rider on the zipline. However, we are not ready to consider the dynamic case, and instead reduce to a static situation. We apply a force to the zipline rider so that the rider is fixed in place. (The cable may still move freely through the zipline pulley. You can imagine this by actually holding the rider in place, or using a string or some other mechanism to apply a force to the rider.)



There are six conditions to satisfy.

1. The left catenary must pass through the point (0,H).

2. The left catenary must pass through the rider position (X,Y).

3. The right catenary must pass through the point (D,0).

4. The right catenary must pass through the point (X,Y).

5. The arc length must be constant.

6. The tension $|\boldsymbol{T}|$ must be continuous at the rider (torque balance).

(Note that this last condition is true because we are assuming a simple model where we have ignored effects due to friction in the pulley. If we allow this model to have friction in the pulley, then tension is no longer continuous at the rider, but has a jump discontinuity proportional to the friction term.)

Below we demonstrate MATLAB code to solve this system. Fill in the equations that determine the first four conditions.

Solving boundary conditions with a stationary rider (External resource) (1.0 points possible)

A stationary rider, more realistic position (External resource) (1.0 points possible)

4. Add a stationary rider

Topic: Final project: Applications to nonlinear differential equations / 4. Add a stationary rider

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Stationary Rider with Variable Height 1

Warning--A stationary rider, more realistic position: if fsolve fails to terminate correctly on last piece of the codes. 2

There apparently was a bad piece of code for the anonymous functions F5 and F6. When I first ran the code it would not converge....fsolve terminated without satisfying the e...