OK.

Well, I like to lay in the hammock in the summer.

And this is our version of that hammock.

So we're having one rope, or perhaps two ropes, hanging between two trees here.

And they span an angle theta on each side here.

And we want to know what is the tension in this rope at the midpoint and here, right where it is attached to the tree.

And here we already have the free-body diagram.

I just drew this piece of the rope here that's hanging on this tree here.

And we made an imaginary cut.

We just cut it in the middle, which means gravity is obviously acting on it.

It's hanging through.

But it does so with m/2 here for our half rope.

We know that there is a tension here at the midpoint, Tmid.

And up here, we have a tension at that end point that goes under this angle here.

I just use an ordinary Cartesian coordinate system with the i-hat direction going in the x direction and j-hat going in the y direction.

So all we need to do is we need to apply Newton's second law and do an F equals ma analysis to figure out what these tensions are.

So let's apply Newton's second law, the F equals ma analysis, to figure out what the tensions are at the midpoint and at the end over there.

So we have F equals ma.

And we'll have to very carefully separate the components here.

Let's start with i-hat.

We have Tmid minus Tend, but of course we have only the projection of Tend, so this is Tend sine theta.

And since this rope is just hanging there, the acceleration is 0.

In the j-hat direction, we have minus m/2 g and then plus Tend.

And here we have the cos theta component, and that is also 0.

So we see from here pretty much immediately that Tend equals m/2 g over cos theta.

And we can stick this one here into the i-hat equation.

So we'll get Tmid equals m/2 cos theta g sine theta.

And that's nothing else but mg/2 over 2 tangent theta.