Differential Equations Name:_____

Catenary Problems

1. A 625 foot wire weighing 2 lb.s per foot is suspended between two towers at the same level. The sag is 25 feet.

   (a) Determine the equation of this particular catenary.

   (b) How far apart are the towers?

   (c) Determine the maximum tension in the wire.

   (d) Determine the angle θ that corresponds to the maximum tension.

2. A 50 foot long rope that weighs 0.1 lb per linear foot is suspended from two level supports. The maximum tension allowed is 10 lb.s.

   (a) Determine the equation of this particular catenary.

   (b) How far apart should the two level supports be placed?

   (c) Determine the sag.

   (d) Determine the angle θ that corresponds to the maximum tension.

   (e) What is the span when the wire is 99 feet above the ground?

3. A wire weighing 0.5 lb per foot is stretched between two level supports 160 feet apart. The wire is 184 feet long and the sag is 40 feet.

   (a) Determine the specific equation for this catenary.

   (b) Determine the maximum tension.

   (c) Determine the angle θ that corresponds to the maximum tension.

4. A transmission wire 800 feet long weighing 0.7 lb per foot is suspended between two towers of equal elevation. The sag is 60 feet.

   (a) Determine the equation of this specific catenary.

   (b) How far apart are the towers?

   (c) Determine the maximum tension on the transmission wire.

More Catenary Problems

1. A 700 foot wire is suspended between two towers of equal elevation 640 feet apart. Determine the sag.

2. Repeat problem 1 using a span of 600 feet.

3. A transmission wire of lineal density 0.6 lb per foot weighs 420 lb.s. The wire is suspended between two towers of equal elevation, 660 feet apart.

   (a) Determine the sag.

   (b) Determine the maximum tension.

4. A 300 foot sleeve of electrical wire hangs from two level supports 240 feet apart. If the maximum tension 1000 lb.s, what is the lineal density of the sleeve?

5. A 400 foot cable is suspended from two level towers.

   (a) If the sag is 100 feet, how far apart are the towers?

   (b) If the maximum tension must not exceed 100 lb.s, what is the maximum lineal density permissible?

6. Repeat problem #5a, given that the sag is 50 feet.