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Problem on arresting a fall.

A climber, mass 70 kg, falls and is caught by a rope before they hit the ground. There is 2.0 m of slack in the rope before the climber falls and the effective spring constant of the rope is 560 N/m.

a) Find the maximum distance the climber falls. Hint: think about conservation of energy.

b) Find the maximum force the rope exerts on the climber

c) When the climber is caught by the rope they bounce up and down for a short while. Roughly, how long does one bounce on the rope take?

c) Find the equilibrium position of the climber as measured from their initial (just before the fall) position.

d) Discuss any approximations made and how these might affect the above results. Think about air resistance, friction in the system, how the rope is modeled.