1. You hold a heavy kettlebell up in the air, at rest, with your arm inclined at a 45-degree angle. The mass of the kettlebell is 7 kg, and the mass of your arm is 4 kg. (You can treat your arm like a uniform rod with length 1 m.) The muscle that holds your arm up is (mainly) the deltoid muscle. Assume that this muscle attaches to your arm at a distance of 10 cm from the shoulder socket (the pivot) to your hand. And assume that in the present case the deltoid muscle is horizontal, as shown in the figure at right.

(a) What force does the deltoid muscle exert?

(b) What is the magnitude of the total force exerted by your shoulder on the lower end of your arm at the pivot?
2. A 2-kg mass oscillates at the end of a spring with a period of 2 seconds.

a) What is the spring constant? Does it matter if the oscillation is horizontal or vertical?

b) Suppose you start the mass oscillating by releasing it from rest when the spring is stretched by \( x = 10 \) cm from its relaxed position. Sketch a graph of the \( x \)-position of the mass as a function of time. On the graph, show the period and the amplitude of the motion. What is the mathematical function that describes this graph?

c) Write equations for the \( x \)-velocity and \( x \)-acceleration of the mass as a function of time, and sketch these, too.
3. A uniform wooden beam with a length of $L = 14$ m and a mass of $M = 90$ kg lies at the edge of a cliff as shown. How far beyond the ledge can a person of mass $m = 60$ kg walk without tipping the beam?