

Name: [5 pts]

1) We cut out a right-angled triangle from a square with side length 1. The vertices of this cut triangle is at  $\{(1/2, 1/2), (1, 0), (1, 1)\}$ . See fig. 1. We want to find the center of mass,  $(x_{CM}, y_{CM})$ , of this uniform surface, i.e. the mass per unit area is constant.

a) Find  $y_{CM}$ . [2 pts]

b) Find  $x_{CM}$ . [4 pts]

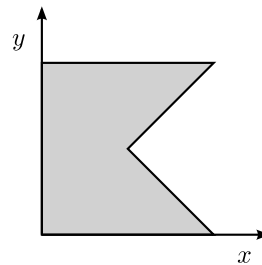


Figure 1: Where is the center of mass?

2) A mass  $m$  is moving with velocity  $v_0$ . In front of this mass there are two similar masses  $m$  connected together by a spring, initially at rest. See fig. 2. The mass on the left collides with the mass in the middle. The collision is elastic and hard (instantaneous).

a) What are the velocities for each one of the masses, right after the collision? [3 pts]

b) What is the velocity of the center of mass of this system? Does it change? [2 pts]

c) What is the maximum amount that the spring compresses? What is the maximum amount that it stretches? [3 pts]

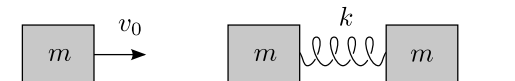


Figure 2: A moving mass spring system.