

## PHY2053 Health, Summer C 2016

## Quiz 3

Date: Wednesday, June 8, 2016

**Problem 1:** An projectile is thrown from the ground at a speed of 100 m/s at an angle above the horizontal. It reaches a maximum height of 375 m and lands on the ground at a distance of 600 m from the launch point. During it's motion through the air, the projectile experiences a constant air drag of 15 N against the motion in the *horizontal direction only*.

- (a) During this process, *launch to landing*, what is the work done by gravity on the projectile?
- (b) During this process, what is the work done by air drag on the projectile?

Optional exercise (do not attempt during the quiz): Find the mass of the projectile. There actually is enough information in the problem to calculate the mass.

**Problem 2:** An object originally at rest at the origin ( $x = y = 0$ ) explodes into three pieces, A, B, and C, of masses  $M$ ,  $2M$  and  $3M$  respectively (the mass of the original object is  $6M$ ). After the explosion, B is seen to be moving in the **negative**  $x$ -direction at a speed of 2 m/s and C is seen to be moving in the **positive**  $y$ -direction at a speed of 1 m/s. There are no other forces acting on A, B, C, or the original object.

- (a) Find the velocity of A after the explosion. Providing the  $x$ - and  $y$ -components of the velocity is sufficient, no need to calculate the magnitude and direction.
- (b) Find the positions of A, B, and C 5 seconds after the explosion. Answer in terms of their  $x$ - and  $y$ -coordinates.
- (c) Find the location of the center of mass of A, B, and C 5 seconds after the explosion. Again answer in terms of  $x$ - and  $y$ - coordinates.