Phy 113: Physics of Sports
Homework Problems
Set #5: Due Wednesday, October 16, 2019

Note: Students are encouraged to work together and discuss the problems. However, each student must arrive at her/his own final answers. Show all your work. Simply copied homework will result in zero.

1. (10 points) A movie stunt woman (for Halle Barry in a James Bond movie) on a motorcycle speeds horizontally off a 9 m high cliff. How fast must she leave the cliff-top (in mph) if she is to land on the level ground below 25 m from the bottom edge of the cliff where the cameras are? (b) How far will she land if the cliff is 7 m high instead and the speed of the motorcycle is the same? (Comment: This problem is related to why taller shot-putters have advantage over shorter shot-putters.)

2. (7 points) The longest distance of Gary Sánchez’s home runs in 2019 was 481 feet, and the launching angle of the ball when it was hit was about 23.5 degrees. Ignoring air resistance, what was the initial velocity (commonly known as “exit” velocity)? Compare your answer with the measured initial velocity of 113.4 mph. Which one is larger? Explain the difference.

3. (14 points) Maxi Moralez, a NYCFC midfielder, passed a soccer ball perfectly from the midfield over the Philadelphia Union defenders to his teammate Héber dos Santos, a striker, who was streaking on the right side of the penalty box towards the goal 29 m away from Maxi. Assuming the initial velocity Maxi kicked the ball was 22 m/s, at what angle did he kick the ball? How long was the ball in the air (assuming no wind resistance)?

4. (25 points) The NY Giants place kicker, Aldrick Rosas, kicks a football against NE Patriots at an angle θ=42.0° with a velocity of 28.0 m/s. Calculate (a) the maximum height, (b) the hangtime, (c) how far away it hits the ground, (d) the velocity vector at the maximum height, and (e) the acceleration vector at the maximum height.

5. (5 point) Watch any sports events (at least one, preferably an MLB playoff game) during the week and identify any particular action you saw in the event to which you can apply what you have learned from the Phy113 course so far. Write down: (1) name of the event/game; (2) date of the event; (3) action of the event; and (4) brief explanation of the action relating to what you have learned from Phy113.