303 Problem Set 2

18. A horizontal rifle is fired at a bull's-eye. The muzzle speed of the bullet is 670 m/s. The gun is pointed directly at the center of the bull's-eye, but the bullet strikes the target 0.025 m below the center. What is the horizontal distance between the end of the rifle and the bull's-eye?

19. mmh A golfer imparts a speed of 30.3 m/s to a ball, and it travels the maximum possible distance before landing on the green. The tee and the green are at the same elevation. **(a)** How much time does the ball spend in the air? **(b)** What is the longest hole in one that the golfer can make, if the ball does not roll when it hits the green?

20. GO A golfer hits a shot to a green that is elevated 3.0 m above the point where the ball is struck. The ball leaves the club at a speed of 14.0 m/s at an angle of 40.0° above the horizontal. It rises to its maximum height and then falls down to the green. Ignoring air resistance, find the speed of the ball just before it lands.

21. ssm In the aerials competition in skiing, the competitors speed down a ramp that slopes sharply upward at the end. The sharp upward slope launches them into the air, where they perform acrobatic maneuvers. The end of a launch ramp is directed 63° above the horizontal. With this launch angle, a skier attains a height of 13 m above the end of the ramp. What is the skier's launch speed?

22. GO A space vehicle is coasting at a constant velocity of 21.0 m/s in the $+y$ direction relative to a space station. The pilot of the vehicle fires a RCS (reaction control system) thruster, which causes it to accelerate at 0.320 m/s^2 in the $+x$ direction. After 45.0 s, the pilot shuts off the RCS thruster. After the RCS thruster is turned off, find **(a)** the magnitude and **(b)** the direction of the vehicle's velocity relative to the space station. Express the direction as an angle measured from the $+y$ direction.