

**Final Homework Assignment**  
**Due Thursday 6/2**

Eugene, Rose and Corvy have discovered a secret portal to the planet *Velocipede* where the gravitational constant is slightly less than the gravitational constant of earth. On *Velocipede* the acceleration due to gravity is  $-4$  meters / second<sup>2</sup> (on Earth it is  $-9.8$  meters / second<sup>2</sup>) Eugene, Rose and Corvy are very excited and spend a lot of time hurling objects directly upward on *Velocipede*, which conveniently has no air resistance.

1. Eugene, Rose and Corvy are on *Velocipede* and they hurl a ball directly upward from a height of eight meters. The ball hits the ground eight seconds later.
  - a. What are the acceleration, velocity and height functions of the ball? Include units for each function. Show your work.
  - b. What is the derivative / anti derivative relationship between the acceleration, velocity and height functions of the ball?
  - c. Use calculus to determine the maximum height of the ball.
  - d. How fast was the ball going when it hit the ground?
  - e. How far, in total, did the ball travel during its flight? Use integral notation to show this.
  
2. Eugene, Rose and Corvy are on *Velocipede* and they use a bike-powered launcher to hurl a ball directly upward with an initial velocity of 140 meters / second. The ball reaches its maximum height of 2470 meters before gravity starts pulling it back to *Velocipede*.
  - a. What is the ball's initial height? Show your work.
  - b. What are the acceleration, velocity and height functions of the ball? Include units for each function.
  - c. How fast was the ball going when it hit the ground?
  - d. How far did the ball travel from  $t = 30$  to  $t = 60$  seconds? Use integral notation to show this.