Math 60, Assignment 13.

Show all your work for full credit.

1. (a) The position of a particle after \( t \) seconds is given by 
   \[ x(t) = t^2 - 4t + 2. \] What is the initial position of the particle?
   (b) What is the velocity of the particle after 5 seconds?
   (c) What is the acceleration of the particle?
   (d) What is the net distance traveled by the particle from time \( t = 0 \) to time \( t = 3 \)?
   (e) What is the total distance traveled by the particle from time \( t = 0 \) to time \( t = 3 \)?

2. The velocity \( v \) of a car after \( t \) seconds is given by \( v(t) = \sin(t) \).
   (a) What is the net change in position of the car from time \( t = 0 \) to time \( t = \frac{3\pi}{2} \)?
   (b) What is the total distance traveled by the car from time \( t = 0 \) to time \( t = \frac{3\pi}{2} \)?
   (c) What is the equation for the acceleration \( a(t) \) of the car at time \( t \)?

3. A red car moving at 50 meters per second drives past a stationary police car. Unfortunately for the red car, the speed limit is 30 meters per second. 5 seconds after the car passes the police officer, the officer chases after the red car, traveling at a speed of \( v(t) = 10t \) for the first 8 seconds, and traveling at a constant speed of 80 meters per second after that. Meanwhile, the red car continues to travel at 50 meters per second.
   (a) How long after the red car passed the police car does the police car catch the red car?
(b) How far does the police car need to travel to catch the red car?

4. (a) A rock is dropped from a cliff that is 50 meters above the ground. What is the equation for the height $y(t)$ of the rock after $t$ seconds?
(b) How many seconds after being dropped will the rock hit the ground?

5. A ball is thrown from the ground with a speed of 40 meters per second at a 60 degree angle above the ground.

(a) What are the equations for the $x$ and $y$ coordinates of the ball after $t$ seconds?
(b) How long after the ball is thrown does it hit the ground?
(c) How far is the landing spot of the ball from it’s initial location?
(d) What is the maximum height that the ball achieves?