Math 135: Intermediate Algebra
Worksheet 10
## December 13, 2007

1. Suppose an object is thrown straight up at a velocity v_0 from an initial height h_0. Its height a time t later is given by

$$h = -\frac{1}{2}gt^2 + v_0 t + h_0,$$

where g is the acceleration of gravity, 10 meters per second^2.

   (a) Suppose a ball is thrown upward at 5 meters per second from a height 100 meters off the ground. Find its height after 4 seconds.

   (b) Graph the height of the ball versus time.

   (c) If the ground is at height 0, how long after it is thrown does the ball hit the ground?

   (d) As your graph shows, ball is initially moving upward. How many seconds after it is thrown does the ball turn around and start falling down?

   (e) What is the maximum height the ball reaches?
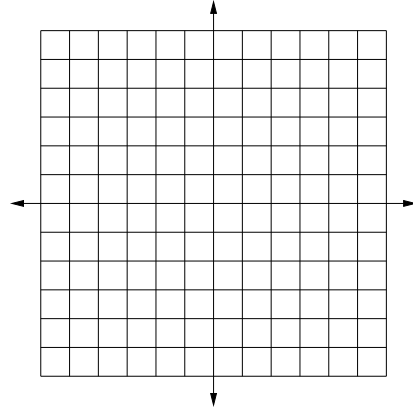
2. Airlines charge more money for tickets on days when lots of people want to fly than on days when few people want to fly. Let's look at a simple model for how this might work.

   (a) Suppose a ticket costs $100 plus $4 for each passenger on the flight. If there are n passengers, write an algebraic for the cost of a ticket.

   (b) In terms of n, how much money will the airline collect in total for the flight?

   (c) Suppose it costs the airline $300 per passenger to run the flight. Write the airline's cost in terms of n.

   (d) Finally, the plane carries cargo. This produces a fixed income of $1000. Write an algebraic expression for the airline's profit (money collected minus cost).

   (e) Graph the airline's profit versus the number of passengers.

   (f) For what range of n does the airline make a profit? A loss?

   (g) What is the airline's maximum possible loss?
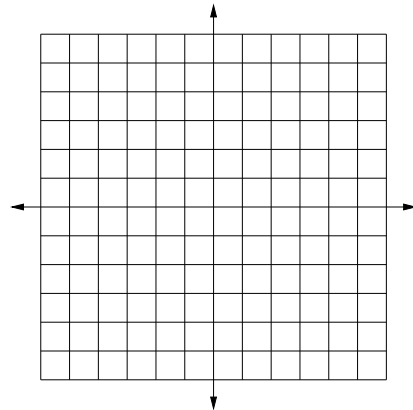
3. In a game of floor hockey, one of the players hits the puck. It slides across the floor and slows down due to friction. After time t seconds it has travelled a distance $d = 8t - 2t^2$ meters. This formula applies until the puck reaches a complete stop.

(a) Graph the puck's distance travelled versus time.

(b) How far does the puck move before coming to a stop? (Hint: on your graph, the puck has reached a complete stop once its distance travelled is no longer increasing.)

(c) The out-of-bounds line is 6 meters from the point where the puck is hit. How long after the puck is hit does it cross the line? (Hint: draw the out of bounds line on your graph, then solve the equation you get.)