Student I.D._____

Math 2250–4

Quiz 4 February 3, 2012

1) Suppose that an object moves vertically, subject only to the acceleration of gravity $g = 32 \frac{ft}{s^2}$ and a

drag force proportional to the object's velocity. Choose the positive y direction to be up and write y'(t) = v(t) for the velocity. For particular values of the object's mass and the drag coefficient, the differential equation

$$\frac{dv}{dt} = -32 - 0.5 \cdot v$$

governs the object's velocity v(t).

1a) Construct a phase diagram and determine $\lim_{t\to\infty} v(t)$ for all solutions to this differential equation. What is the term for this limiting velocity?

(3 points)

1b) Solve the following initial value problem for the differential equation above,

$$\frac{dv}{dt} = -32 - 0.5 \cdot v$$

$$v(0) = 40.$$
(5 points)

Note that the object is initially thrown upwards.

1c) Find a formula for the height y(t) of the object, assuming y(0) = 0.

(2 points)

There's not time to ask on this quiz, but could you figure out the maximum height that the object attains?