

due August 30, 2013 at the beginning of class

Topics covered : equations $y' = ay + b$, where a and b are constant, and separable equations (corresponds to sections 1.2, 2.2 in the textbook). *You do not need to use calculator for this assignment.*

1. Assume that the velocity v of the falling object satisfies the following differential equation:

$$v'(t) = 9.8 - \frac{v}{30} \quad (1)$$

- (a) Find a number v_e such that $v(t) \equiv v_e$ is a solution of equation (1) (in other words find the equilibrium solution of (1)).
- (b) Solve the equation (1) with initial condition $v(0) = 98$. What is the limit of this solution when $t \rightarrow +\infty$? How this limiting velocity is related to your answer in the item (a)?
- (c) Find the time that must elapse for the object to reach $\frac{2}{3}$ of the limiting velocity found in the item (b).
- (d) How far does the object fall in the time found in the item (c)?

2. Solve the following differential equations (find the general solutions):

(a) $(1 + x^2)^{1/3}y' + xy^2 = 0$

(b) $dx + x^4 \sin y dy = 0$;