Physics 3344
Spring 2000

Professor Scalise
Assignment #7

Due: 7 March 2000

1. (a) Graph the vector field $\vec{A}(x, y, z) = y^2 \hat{e}_x$.
   (b) Find the curl of $\vec{A}$ everywhere (in functional form).
   (c) Find the divergence of $\vec{A}$ at the point (4,5,0). (This is a number.)
2. True or false? The gradient of the divergence of any vector field vanishes. That is, $\vec{\nabla}(\vec{\nabla} \cdot \vec{A}) = 0$ for all vector fields $\vec{A}(\vec{r})$. If true, prove it. If false, give a counter-example.
3. A particle is given an initial velocity $v_0 = 1.5 v_{terminal}$ downward in a vertical tank of viscous fluid with gravity. What is the initial acceleration vector (magnitude **and** direction)?
4. A railroad boxcar of mass m on a level frictionless track has initial speed v_0 at the origin. There is an aerodynamic drag force $(-cv\vec{v})$ acting horizontally. Find
   (a) $v(t)$
   (b) $x(t)$
   (c) $v(x)$
5. Marion & Thornton 2.53, 2.54, 2.56