Math 2400 Calculus 3, Fall 2014
Homework Set 11

Due: 11/11/14

1. Section 12.9: #12, 14
2. Section 13.1: #24
3. Let $\vec{x} = \langle x, y, z \rangle$ and let c be a positive constant. Define the vector field

$$\vec{G}(\vec{x}) = -\frac{c}{|\vec{x}|^3}\vec{x}.$$

   (a) Deduce that $\vec{G}(\vec{x})$ is a conservative field by showing that it has potential function

   $$g(x, y, z) = \frac{c}{\sqrt{x^2 + y^2 + z^2}}.$$

   (b) Suppose that $\vec{G}(\vec{x})$ is the vector field associated to a force. Is the force attractive or repulsive?

4. (a) Suppose that $\vec{F}$ is a vector field that is perpendicular to a smooth curve C at each point of C. Explain why $\int_C \vec{F} \cdot d\vec{r} = 0$.

   (b) Is it true that if $\int_C \vec{F} \cdot d\vec{r} = 0$ then $\vec{F}$ must be perpendicular to C at every point of C? If so, justify your answer. If not, give an example where it is not true.