HOMEWORK 9, MATH 175 - FALL 2009

DUE FRIDAY NOVEMBER 20TH (AT THE BEGINNING OF CLASS)

This homework assignment covers Sections 17.1-17.4 in the book.

1. Sketch the vector field $F(x,y) = \frac{1}{x}\mathbf{i} + y\mathbf{j}$.

2. Find the gradient vector field for $f(x,y) = x^2 - y$ and sketch it.

3. Evaluate the line integral $\int_C x \sin y \; ds$ where C is the line segment from $(0,3)$ to $(4,6)$.

4. Evaluate the line integral $\int_C \sin x \; dx + \cos y \; dy$, where C consists of the top half of the circle $x^2 + y^2 = 1$ from $(1,0)$ to $(-1,0)$ and the line segment from $(-1,0)$ to $(-2,3)$.

5. Evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $F(x,y,z) = (x+y)\mathbf{i} + (y-z)\mathbf{j} + z^2\mathbf{k}$ and C is given by the vector function $\mathbf{r}(t) = t^2\mathbf{i} + t^3\mathbf{j} + t^2\mathbf{k}$, $0 \leq t \leq 1$.

6. Evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $F(x,y,z) = (2xz + y^2)\mathbf{i} + 2xy\mathbf{j} + (x^2 + 3z^2)\mathbf{k}$ and C is given by $x = t^2, y = t + 1, z = 2t - 1$, $0 \leq t \leq 1$.

7. Evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $F(x,y,z) = e^y\mathbf{i} + xe^y\mathbf{j} + (z+1)e^z\mathbf{k}$, and C is given by $\mathbf{r}(t) = t\mathbf{i} + t^2\mathbf{j} + t^3\mathbf{k}, 0 \leq t \leq 1$.

8. Evaluate the line integral $\int_C \cos y \; dx + x^2 \sin y \; dy$, where C is the rectangle with vertices $(0,0)$, $(5,0)$, $(5,2)$, and $(0,2)$ oriented positively.

9. Evaluate the line integral $\int_C \sin y \; dx + x \cos y \; dy$, where C is given by the ellipse $x^2 + xy + y^2 = 1$, oriented positively.