

V63.0123-1 : Calculus III. Homework 9

due Wed Apr 16 at lecture.

17.1: (Vector fields)

1.

29–32. (Totalling about one question's worth)

A1. Sketch contour lines of $f(x, y) = e^{-x^2-y^2}$, and plot the gradient vector field ∇f . Be sure to indicate what happens to the size of ∇f at very small radii ($r \ll 1$) and large radii ($r \gg 1$).

17.2: (Line integrals)

1.

12. (easier than 8, so attempt it first).

8. This is a longer one (four single integrals to do).

19.

20.

32.

17.3: (Fundamental Theorem for line integrals)

3.

8. quick.

14. also quick.

A2. [rephrased Qu.22]. Find $\int_C \mathbf{F} \cdot d\mathbf{r}$ for $\mathbf{F} = (y^2/x^2)\mathbf{i} - (2y/x)\mathbf{j}$, where the curve C goes from $(1, 1)$ to $(4, -2)$.

17.4: (Green's Theorem)

4. [see 1 if stuck. What does the integrand in Green's Theorem here tell you about the answer if you chose *any* closed C ?]

8.

12. so quick you will laugh with joy.

14. Also draw a diagram showing the positive orientation of boundary curve [see p. 1106 for how this works in this non-simply-connected region].

15.