Honors Calculus 252-2

Winter 2002

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Review Sheet for Final

Note: As always for review sheets: **do only the problems you have difficulties with.**

1. 8.1.3, 8.1.10, 8.1.8v+vi,
2. Determine the streamlines for the flow given by
$$\mathbf{v} = (\frac{-y}{x^2+y^2}, \frac{x}{x^2+y^2}, 0). \tag{1}$$
3. 8.2.1, then redo 8.2.1 with the vector field $\mathbf{F} = (2x+3y, 3x-2y, 0)$. Compare the two cases. Do you see a qualitative difference?
4. 8.2.12
5. For the magnetic field $\mathbf{B} = (y, z, x)$ determine a vector potential $\mathbf{A}$ such that $\mathbf{B} = \nabla \times \mathbf{A}$.
6. Consider the vector field $\mathbf{v} = (x, y + \alpha z, z + \beta y)$.
   (a) For which values of α and β is $\mathbf{v}$ conservative?
   (b) Under which condition can $\mathbf{v}$ be written as $\mathbf{v} = \nabla\phi$? Determine ϕ for the cases for which it is possible.
   (c) For $\alpha = 1$ and $\beta = 1$ determine
   $$\int_{\mathcal{C}} \mathbf{v} \cdot d\mathbf{r} \tag{2}$$
   where the contour $\mathcal{C}$ is given by
   $$\mathbf{r}(t) = (2t, \frac{8t}{2+t}, \frac{4t}{\sqrt{2+t}}) \qquad \text{with} \qquad 0 \le t \le 2. \tag{3}$$
7. 8.3.4, 8.3.12, 8.3.14
8. 8.4.4, 8.4.14, 8.4.18
9. 8.5.1, 8.5.10
10. For the flow field $\mathbf{v} = (x^2, xy, yz)$ calculate the net flux across the surface of the cube defined by the corners $(0,0,0)$, $(1,0,0)$, $(0,1,0)$, $(0,0,1)$.
11. 8.6.1, 8.6.13, 8.6.16
12. 7.1.10, 7.1.20
13. 7.2.5, 7.2.24
14. 7.3.13
15. 7.4.7, 7.4.14
16. 7.5.3, 7.5.4