Answers to Even Exercises, Homework Set 14

Section 13.5

2 curl$\vec{F} = \nabla \times \vec{F} = \langle x(z^2 - y^2), y(x^2 - z^2), z(y^2 - x^2) \rangle$, and div$\vec{F} = \nabla \cdot \vec{F} = 6xyz$

4 curl$\vec{F} = \nabla \times \vec{F} = \langle x(\sin(xz) - \cos(xy)), y\cos(xy), z\sin(xz) \rangle$, and div$\vec{F} = \nabla \cdot \vec{F} = 0$

8 If $\vec{F} = P\vec{i} + Q\vec{j} + R\vec{k}$, then we know $R = 0$. Since P and Q don't vary in the z-direction, $\frac{\partial R}{\partial x} = \frac{\partial R}{\partial y} = \frac{\partial R}{\partial z} = \frac{\partial P}{\partial z} = \frac{\partial Q}{\partial z} = 0$. As x increases, the x-component of each vector of $\vec{F}$ increases while the y-componenet remains constant, so $\frac{\partial P}{\partial x} > 0$ and $\frac{\partial Q}{\partial x} = 0$. Similarily as y-increases, we see $\frac{\partial P}{\partial y} = 0$ and $\frac{\partial Q}{\partial y} > 0$. Putting everything together we get:

(a) div $\vec{F} > 0$

(b) curl $\vec{F} = \vec{0}$

10 (a) meaningless, (b) vector field, (c) scalar field, (d) vector field, (e) meaningless, (f) vector field, (g) scalar field, (h) meaningless, (i) vector field, (j) meaningless, (k) meaningless, (l) scalar field

22 these remaining three problems are posted handwritten

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