

Homework Assignment for Week 15

- Section 16.3: Problems 1, 3, 5, 9, 11, 19, 21, 26, 29, 33.
- Let $\mathbf{F} = \frac{x}{\sqrt{x^2+y^2}}\mathbf{i} + \frac{y}{\sqrt{x^2+y^2}}\mathbf{j} + 0\mathbf{k}$ and $\mathbf{G} = \frac{-y}{x^2+y^2}\mathbf{i} + \frac{x}{x^2+y^2}\mathbf{j} + 0\mathbf{k}$.
 - Show that both \mathbf{F} and \mathbf{G} satisfy the component test.
 - The natural domain for both \mathbf{F} and \mathbf{G} is $\{(x, y, z), x^2 + y^2 \neq 0\}$ (that is where \mathbf{F} and \mathbf{G} are defined). Show that \mathbf{F} is conservative in this domain by finding its potential function.
 - Show that \mathbf{G} is NOT conservative in this domain (read example 5).
 - If given another \mathbf{H} satisfying the component test in this domain, how do you determine whether \mathbf{H} is conservative?
- Let $\mathbf{F} = \frac{x}{\sqrt{x^2+y^2+z^2}}\mathbf{i} + \frac{y}{\sqrt{x^2+y^2+z^2}}\mathbf{j} + \frac{z}{\sqrt{x^2+y^2+z^2}}\mathbf{k}$. What is the natural domain for \mathbf{F} ? Show that \mathbf{F} satisfies the component test in this domain. Is this domain simply connected? Is \mathbf{F} conservative in this domain?