1. False; $\operatorname{div}\mathbf{F}$ is a scalar field.

2. True. (See Definition 13.5.1.)

3. True, by Theorem 13.5.3 and the fact that $\operatorname{div}\mathbf{0} = 0$.

4. True, by Theorem 13.3.2.

5. False. See Exercise 13.3.31. (But the assertion is true if D is simply-connected; see Theorem 13.3.6.)

6. False. See the discussion accompanying Figure 8 on page 766.

7. False. For example, $\operatorname{div}(y\,\mathbf{i}) = 0 = \operatorname{div}(x\,\mathbf{j})$ but $y\,\mathbf{i} \neq x\,\mathbf{j}$.

8. True. Line integrals of conservative vector fields are independent of path, and by Theorem 13.3.3, work $= \int_C \mathbf{F}\cdot d\mathbf{r} = \mathbf{0}$ for any closed path C.

9. True. See Exercise 13.5.22.

10. False. $\mathbf{F}\cdot\mathbf{G}$ is a scalar field, so $\operatorname{curl}(\mathbf{F}\cdot\mathbf{G})$ has no meaning.

11. True. Apply the Divergence Theorem and use the fact that $\operatorname{div}\mathbf{F} = \mathbf{0}$.

12. False by Theorem 13.5.11, because if it were true, then $\operatorname{div}\operatorname{curl}\mathbf{F} = \mathbf{3} \neq \mathbf{0}$.