MA 213 Worksheet #23

Sections 16.5 and 16.6
04/16/19

1 *16.5.1* Find (1) the curl and (2) the divergence of the vector field

$$\mathbf{F}(x, y, z) = xy^2z^2\mathbf{i} + x^2yz^2\mathbf{j} + x^2y^2z\mathbf{k}.$$

2 *16.5.15* Determine whether or not the vector field $\mathbf{F}(x, y, z) = z\cos(y)\mathbf{i} + xz\sin(y)\mathbf{j} + x\cos(y)\mathbf{k}$ is conservative. If it is conservative, find a function f such that $\mathbf{F} = \nabla f$.

3 *16.5.23* Let $\mathbf{F}$ and $\mathbf{G}$ be vector fields. Prove the identity, assuming that the appropriate partial derivatives exist and are continuous.

$$\text{div } (\mathbf{F} + \mathbf{G}) = \text{div } \mathbf{F} + \text{div } \mathbf{G}.$$

4 *16.6.5* Identify the surface with the vector equation:

$$\mathbf{r}(s, t) = \langle s\cos t, s\sin t, s\rangle.$$

5 *16.6.21* Find a parametric representation for the part of the hyperboloid $4x^2 - 4y^2 - z^2 = 4$ that lies in front of the yz-plane.

6 *16.6.37* Find an equation of the tangent plane to the parametric surface

$$\mathbf{r}(u, v) = \langle u^2, 2u\sin v, u\cos v\rangle,$$

at the point $u = 1, v = 0$.

7 *16.6.47* Find the area of the part of the paraboloid $y = x^2 + z^2$ that lies within the cylinder $x^2 + z^2 = 16$.