Assignment 18 (2/27)

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Problem 1

Problems 16.3.(7, 12, 14, 19, 26, 30, 34).

Problem 2

Note that in class we showed that the tangent plane through $\vec{r}_0 = (x_0, y_0, z_0)$ to the surface $f(x, y, z) = k$ is perpendicular to $\nabla f(\mathbf{r}_0)$ and so its equation is given by

$$(\mathbf{r}(t)-\mathbf{r}_0)\cdot\nabla f(\mathbf{r}_0) = 0 \Longleftrightarrow (x-x_0)\frac{\partial f}{\partial x}(x_0, y_0, z_0)+(y-y_0)\frac{\partial f}{\partial y}(x_0, y_0, z_0)+(z-z_0)\frac{\partial f}{\partial z}(x_0, y_0, z_0) = 0$$

Similarly, the **Normal Line** to the surface $f(x, y, z) = k$ at a point $\mathbf{r}_0 = (x_0, y_0, z_0)$ is the line that passes through (x_0, y_0, z_0) and is parallel to $\nabla f(\mathbf{r}_0)$. So its equation is given by

$$\mathbf{r}(t) = \mathbf{r}_0 + t\nabla f(\mathbf{r}_0) \Longleftrightarrow \frac{x-x_0}{\frac{\partial f}{\partial x}(x_0, y_0, z_0)} = \frac{y-y_0}{\frac{\partial f}{\partial y}(x_0, y_0, z_0)} = \frac{z-z_0}{\frac{\partial f}{\partial z}(x_0, y_0, z_0)}$$

Problems 16.4.(1, 4, 13, 14, 21, 28, 35, 39). Try drawing 39(c) without using any computer/calculator graphing software.