This homework set has five (5) problems. Some of them are routine, others require more thought. You are encouraged to work with others and to ask questions of your instructor; however, you must write up your solutions independently. On this and all subsequent homework sets please write neatly in complete sentences. Writing mathematics is a craft, aim to hone this skill!

1. Stewart Exercise 15.4: 40

2. Suppose $f : \mathbb{R} \to \mathbb{R}$ is differentiable everywhere. Show that all tangent planes to the surface $z = xf(y/x)$ intersect in a common point.

3. Stewart Exercises 15.5: 42 [Doable ages ago in Calculus I, but quicker now?]

4. Among all tangent planes to the surface $xy^2z^2 = 1$, which one(s) are farthest from the origin?

5. Show that the function

$$f(x, y) = \begin{cases} xy^2 & \text{if } (x, y) \neq (0, 0) \\ x^2 + y^4 & \text{if } (x, y) = (0, 0) \end{cases}$$

has directional derivatives in every direction at $(0, 0)$, yet is not even continuous at $(0, 0)$. 