Math 2130 - Homework # 1

Functions and Surfaces

Part 1 - Basics

1. Plot the following points in the xyz-space.
   (a) $(x, y, z) = (0, 2, 1)$
   (b) $(x, y, z) = (-3, 4, 5)$
   (c) $(x, y, z) = (4, 1, -1)$
   (d) $(x, y, z) = (1, -2, 4)$
2. Sketch the following cylinders.
   (a) $z = y^2$
   (b) $x^2 + y^2 = 1$
3. Sketch the graph of $x^2 + y^2 + z^2 = 1$

Part 2 - Graphing functions with traces

4. Let $f(x, y) = \sqrt{x^2 + y^2}$.
   (a) Draw the $x = 0$ trace.
   (b) Draw the $y = 0$ trace.
   (c) Draw the $z = 0$ trace.
   (d) Draw the $z = 1$ trace.
   (e) Sketch the graph of f.

5. Let $f(x, y) = 4 - x^2 - y^2$.
   (a) Draw the $x = 0$ trace.
   (b) Draw the $y = 0$ trace.
   (c) Draw the $z = 0$ trace.
   (d) Draw the $z = 4$ trace.
   (e) Sketch the graph of f.
6. Let $f(x, y) = x^2 + 9y^2$.
   (a) Draw the $x = 0$ trace.
   (b) Draw the $y = 0$ trace.
   (c) Draw the $z = 0$ trace.
   (d) Draw the $z = 1$ trace.
   (e) Draw the $z = 9$ trace.
   (f) Sketch the graph of f.

Part 3 - Level curves

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7. Draw the level curves of $f(x, y) = x^2 + 2y^2$ for $k = 0, 2, 4$.
8. Draw the level curves of $f(x, y) = y$ for $k = -2, -1, 0, 1, 2$.
9. Draw the level curves of $f(x, y) = 6 - x - 2y$ for $k = 0, 3, 6$.
10. Draw the level curves of $f(x, y) = 3 - x^2 - y^2$ for $k = 3, 2, 0, -1$.
