

Problem Set 6

October 23, 2023

All numbered exercises are from the textbook *Calculus Vol. 3*, by OpenStax.

1. Exercises 4.1.5–13 (odd only).
2. Exercise 4.1.36.
3. Exercises 4.2.61–75 (odd only).
4. Exercises 4.2.91–97 (odd only).
5. Find and sketch the domain of the function:

(a) $f(x, y) = \sqrt{x-2} + \sqrt{y-1}$

(b) $f(x, y) = \ln(9 - x^2 - y^2)$

(c) $f(x, y) = \frac{\sqrt{y-x^2}}{1-x^2}$

(d) $f(x, y) = \frac{\ln(2-x)}{1-x^2-y^2}$.

6. Describe the level surfaces of the function:

(a) $f(x, y, z) = x + 3y + 5z$

(b) $f(x, y) = y^2 + z^2$

(c) $f(x, y) = x^2 - y^2 - z^2$.

7. Find the limit of the function if it exists or prove it does not exist:

(a) $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2y + xy^2}{x^2 - y^2}$

(b) $\lim_{(x,y) \rightarrow (0,0)} \frac{5y^4 \cos^2 x}{x^4 + y^4}$

(c) $\lim_{(x,y) \rightarrow (0,0)} \frac{x^{2023}}{x^2 + y^2}$

(d) $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2y^2z^2}{x^2 + y^2 + z^2}$.