Exercises

Chapter 11.3 # 1, 3, 7

Chapter 11.4 # 1, 5, 7, 9, 11

Problem A: Sketch the direction field for \( F = xyi + j \) (the direction field is just the vector field \( F \) drawn with all vectors the same, short, length). Find an equation for the streamline through the point \((1, 0)\) and draw it on the same sketch.

Problem B: Let \( \varphi(x, y) = 2x - y \). Draw level curves for \( \varphi \). On the same sketch, draw the gradient vector field \( \nabla \varphi \).

Problem C: Let \( \varphi(x, y) = xy \). Draw level curves for \( \varphi \). On the same sketch, draw the gradient vector field \( \nabla \varphi \).

Problem D: Describe the level surfaces of \( \varphi(x, y, z) = y^2 + z^2 \).

Problem E: Level curves of a function \( \varphi(x, y) \) are shown below. Draw five streamlines of \( F = \nabla \varphi \) through the five marked points.