1. Determine for which values of \( m \) the function \( y = x^m \) is a solution of the ODE \( x^2 y'' - xy' - 5y = 0 \). Problem (9ed) 21(b), section 1.2.

2. Use Euler’s method with step size 0.2 to estimate the solution of the IVP \( y' = x + y, \ y(0) = 0 \) at 4. Compare section 1.4 problem 3 or 4 depending on the edition. Answer: -1.04.

3. Find the orthogonal family to the family of curves \( 2x^2 + y^2 = k \). problem 33(a), Section 2.4.

4. Find the general solution to the first order linear equation \( y' = \frac{y}{x} + 2x + 1 \). Problem 7 section 2.3.

5. Is the equation \( (2xy^2 - \sin(x))dx + 2x^2ydy = 0 \) exact? If so, find the general solution. Slight variation on Example 1, section 2.4 (see also the sample exam).

Part B. Do Two.

i. Identify which of the two direction fields attached to this exam is the direction field for the ODE \( y' = x^2 + y^2 \). On that direction field, sketch (approximations to) the solutions passing through the points \((0,0), (0,1)\) and \((0,-1)\) (so three curves in all).

ii. Show \( y = 0 \) is a solution of the IVP \( y' = 3y^\frac{2}{3}, \ y(0) = 0 \). Find another solution. Discuss the relation of this IVP to the existence and uniqueness theorem for first order IVPs. Example 9, section 1.2.