

MATH 3C DIFF EQTS, DIRECTION FIELDS, AND ISOCLINES

I. Differential equations (DE)

Keywords: ordinary DE, partial DE, general solution, particular solution, initial condition, initial-value problem

Q: How do you tell if a given function is a solution to a differential equation or not?

Example. Is $y = e^{2t}$ a solution to $y'' = 2y$?

****Solving an ODE graphically****

II. Direction fields

Keywords: equilibrium solution, stable, unstable, semistable)

Q: How do you draw them? Why are they useful?

Examples.

1) $y' = t$

2) $y' = y$

Equilibrium solution:

Stable? Unstable? Semistable?

III. Isoclines

Q: How do you draw them? Why are they useful?

Example. $y' = y + t$

IV. Practice

1. a) Draw the direction field for $y' = y^2$.
b) Are there any equilibrium solutions? If yes, are they stable, unstable, or semistable?
2. Draw the isoclines for $y' = -y$ for $c = 0, 1$, and 2 .
3. a) Draw the direction field for $y' = \frac{1}{t}$.
b) Are there any equilibrium solutions? If yes, are they stable, unstable, or semistable?
4. Draw the isoclines for $y' = 2t - y$ for $c = 0, 1$, and 2 .
5. a) Draw the direction field for $y' = y^2 + t$.
b) Are there any equilibrium solutions? If yes, are they stable, unstable, or semistable?
6. Draw the isoclines for $y' = y^2 + 2t^2$ for $c = 0, 1$, and 2 .