

CALCULUS II, SUMMER 2015 - ODE WORKSHEET 3

Problem 1. Find a first-order differential equation having each of the following families of curves as integral curves

- (1) $2x + 3y = C$;
- (2) $x^2 + y^2 + 2Cy = 1$;
- (3) $y^4(x + 2) = C(x - 2)$;
- (4) $y = C \cos x$;
- (5) $\arctan y + \arcsin x = C$;
- (6) All circles through the points $(1, 0)$ and $(-1, 0)$;
- (7) All circles through the points $(1, 1)$ and $(-1, -1)$.

Problem 2. Sketch a direction field for each of the following differential equations and use it to construct three solution curves.

- (1) $y' = x - y + 1$;
- (2) $y' = \frac{1}{2}y$.

Problem 3. Sketch a direction field for each of the following differential equations and use it to sketch a solution curve that passes through each of the given points.

- (1) $y' = 1 - xy$, through $(0, 0)$;
- (2) $y' = y + xy$, through $(0, 1)$;
- (3) $y' = y - 2x$, through $(1, 0)$;
- (4) $y' = x - xy$, through $(0, 1)$;
- (5) $y' = \frac{x-y}{x+y}$, through $(1, 1)$

Suggested reading: Stewart, pp.417-418; Apostol, §§8.21, §§8.22, §§8.27 (as much as you can)