Calc AB

Lesson 104

Agenda:
- Lesson 104
- Graphs of Solutions of DE
- Slope fields
- Recognizing Slope fields

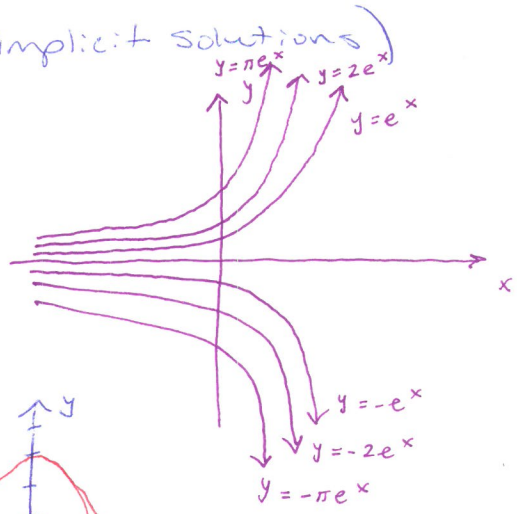
Recall: $A'(t) = A(t)$ has solution $A(t) = A_0 e^t$, where A_0 is any constant, this is the General solution to the differential equation.

Furthermore, We say we have explicit solutions to the differential equation because the solutions can be described as functions of x. (Otherwise implicit solutions)

$A(t) = A_0 e^t$ is a family of solutions that include:

$A(t) = e^t$, $A(t) = -e^t$, $A(t) = 2e^t$ $A(t) = \pi e^t$

Particular Solutions – similar graphs →



Ex. 104.1 Solve the differential Equation $\frac{dy}{dx} = -2x$. Graph 4 particular solutions, including one that passes through (1,1).

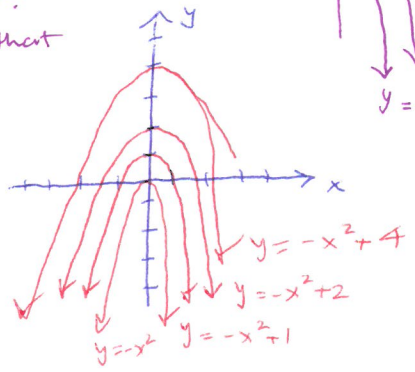
$y = -x^2 + C$

Particular: (1,1)

$y = -x^2 + 2$

$y = -x^2$, $y = -x^2 + 1$

$y = -x^2 + 4$

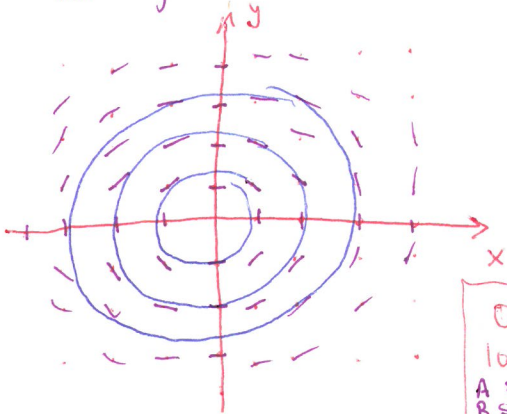


Slope fields:

useful when it is difficult or impossible to find the equation of the solutions.

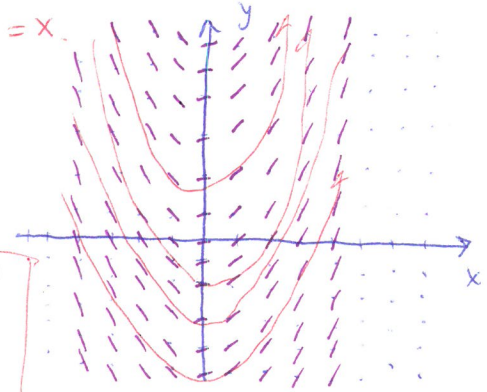
Ex. Slope field for $\frac{dy}{dx} = \frac{-x}{y}$ Solution is $y^2 + x^2 = C$

x	y	slope
not 0	0	undefined
0	not 0	0
	1	-1
-1	1	1
1	-1	1
2	1	-2
-2	1	2
-2	-1	-2



Ex. 104.2 Draw a slope field for the diff. Equ. $\frac{dy}{dx} = x$.

$y = \frac{x^2}{2} + C$



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104.4 and 104.5

A slope ≥ 0	A (b)
B Sym x-axis	B (d)
C Correct	C (c)
D $x = -y$ slope = 0	D (a)