

Read: Boas Chapter 8 Sections 2-4

- (1) Explore the solutions and solution space of

$$u'(x) = u^2(x) - x$$

using the slope field techniques we just discussed on Tuesday Jan. 24.

- (2) Show that

$$3u^2 \frac{du}{dx} + x^2 = 0$$

is exact and find the solution. Are there any more solutions?

Here are the mathematica snippets I used in class. I have used “(up carrot)” to designate the power symbol above the 6 on your keyboard since I didn’t find a way to typeset it. First just solving the ODE I used, `DSolve[y'[x] == -2*x*y[x](up carrot) 2, y[-1] == .6, y, x]`

Setting up the slope-field-with solution plot I used

`sol = DSolve[y'[x] == -2*x*y[x](up carrot) 2, y, x]`

and for the plot I used

`Show[VectorPlot[1, -2*x*y (up carrot) 2, x, -2, 2, y, -2, 2, VectorStyle -> Arrowheads[0.026]], Plot[Evaluate[y[x] /. sol /. C[1] -> -2/3], x, -2, 2]]` (Actually I didn’t use this initial condition - you might try it to see what the curve is.)