Unit 1 Lesson 4 Notes: Numerical Methods

- A pair of $f(x,y) = y'$ and $y(x_0) = y_0$ is an IVP problem

- Euler's method functions by taking small steps forward along an axis:

$$y_n \approx y'(x_{n-1})h + y(x_{n-1})$$

$$y_{n-1}$$

Where h is the stepsize

$$x_n = x_{n-1} + h$$

Euler's method is nearly identical to the tangent line approximation

Unit 1 Lesson 4 Problem: Numerical Methods

- We have the following table:

Step #	x	y	slope at	results in
0	0	-1	1	(0.5, -0.5)
1	0.5	-0.5	-0.25	(1, -0.625)

Unit 1 Lesson 4 Problem: Numerical Methods

1: Making another table:

#	x	y	slope
0	0	-1	1
1	0.5	-0.5	0
2	1	-0.5	-0.25
3	1.5	-2	

2: Too ~~small~~ large

Unit 1 Lesson 4 Problems

Problem 1: $h = 0.25$ $h = 0.1$

All tables are of the form

Step #	X	Y	Slope
0	0	2	-2
1	0.125	1.5	-1.5
2	0.5	1.125	-1.125

0	0	2	-2
1	0.1	1.8	-1.8
2	0.2	1.62	-1.62
3	0.3	1.45	-1.458
4	0.4	1.312	-1.312
5	0.5	1.181	-1.181

Problem 2

0	0	2	4
1	0.25	3	6
2	0.5	4.5	9

0	0	2	4
1	0.1	2.4	4.8
2	0.2	2.88	5.76
3	0.3	3.456	6.912
4	0.4	4.147	8.294
5	0.5	4.977	9.953

0	0	2	-2
1	0.25	1.563	-1.313
2	0.5	1.297	-0.797

0	0	2	-2
1	0.1	1.81	-1.71
2	0.2	1.649	-1.449
3	0.3	1.514	-1.214
4	0.4	1.403	-1.003
5	0.5	1.312	-0.812