Computational Physics 3
HW 4
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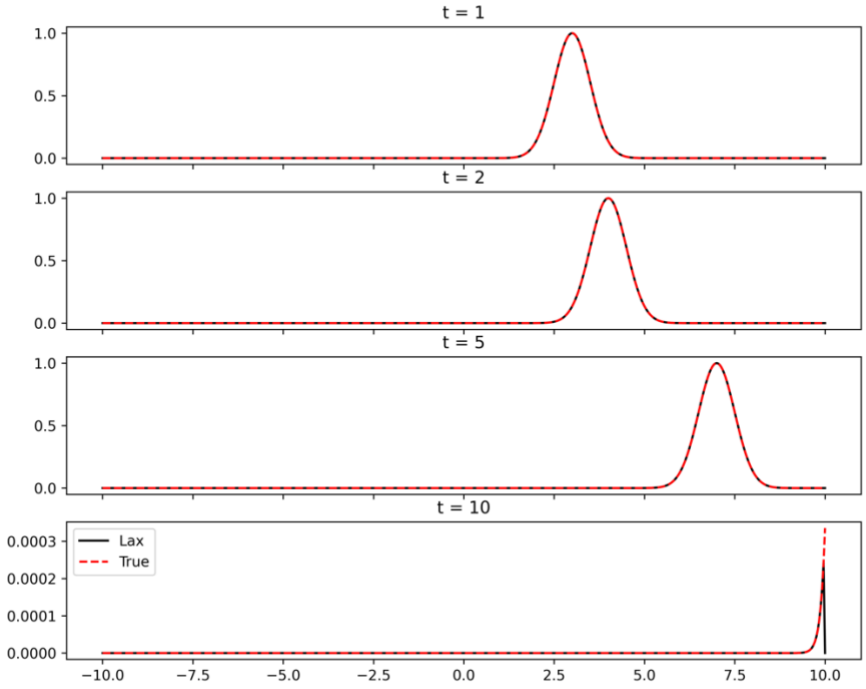
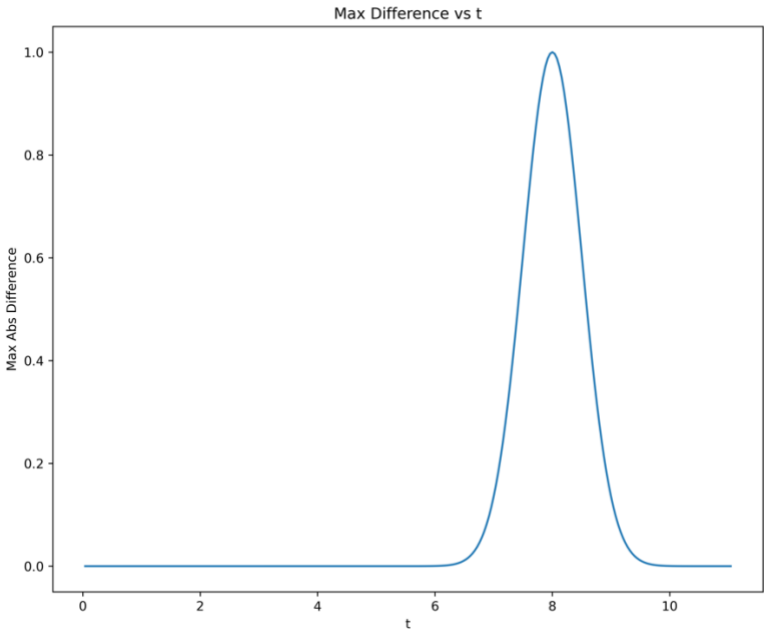
## *Problem 1*

1a)

The numeric and analytic solutions match almost entirely except for at the boundary.

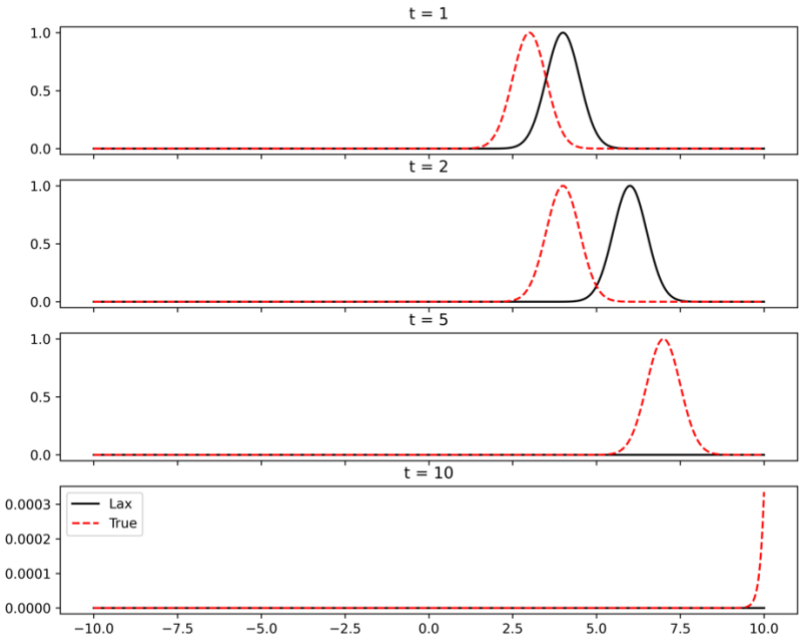


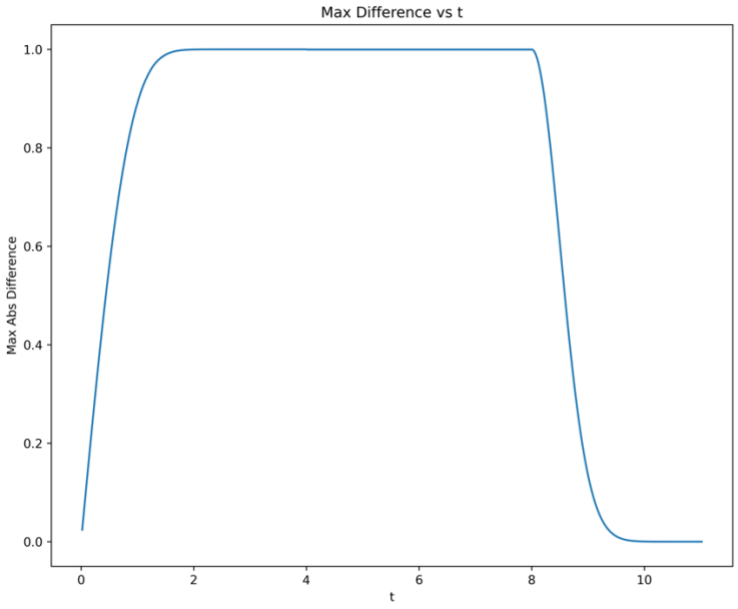

The analytic solution was found to be: $e^{-2*((x-vt)-2)^2}$




1b)

The numeric solution and analytic solution do not match. The numeric solution travels at a much slower pace.






***Problem 2***

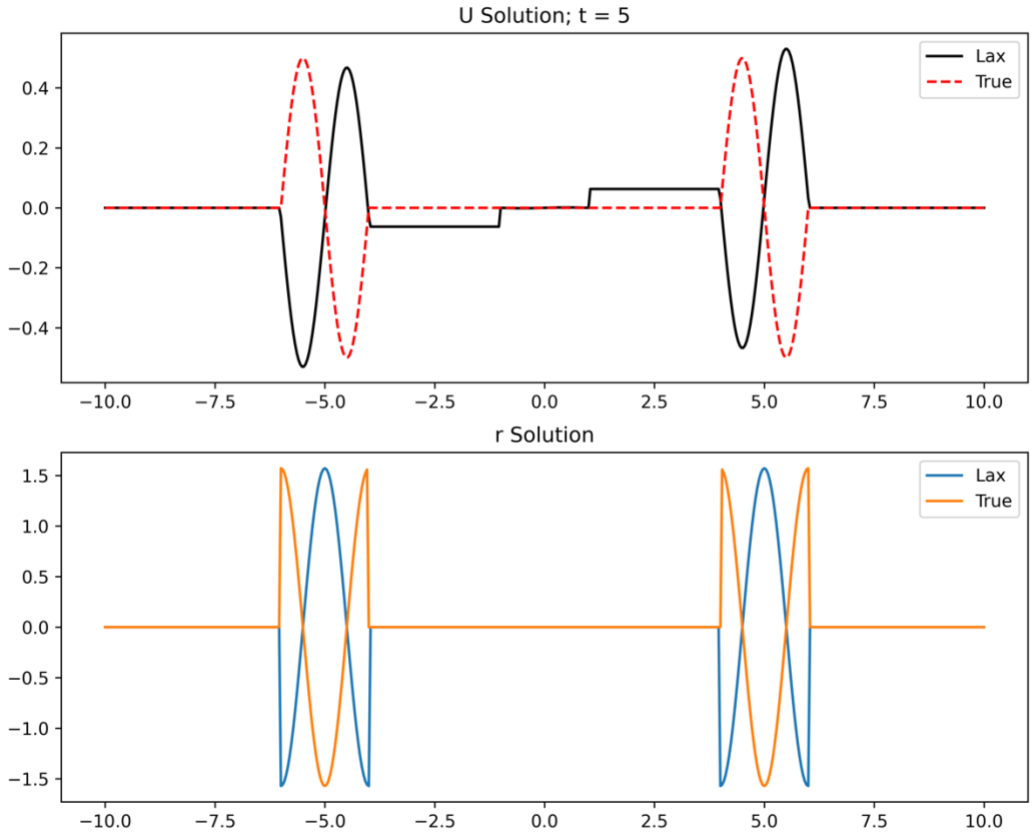
2a)

The Lax scheme was found in the textbook as:

$$r_j^{n+1} = .5 * \left(r_{j+1}^n - r_{j-1}^n\right) + \frac{v\Delta t}{2\Delta x} * (s_{j+1}^n - s_{j-1}^n)$$

$$s_j^{n+1} = .5 * \left(s_{j+1}^n - s_{j-1}^n\right) + \frac{v\Delta t}{2\Delta x} * (r_{j+1}^n - r_{j-1}^n)$$

2b)



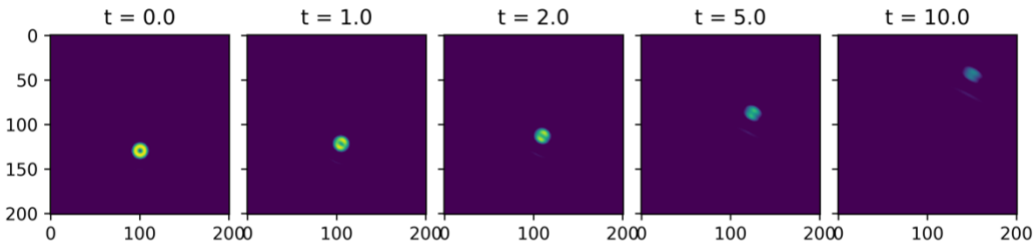

The analytic solution for u and r were found to be:

$$u = .5 * [\sin(\pi * (x - vt)) + \sin(\pi * (x + vt))]$$

$$r = .5 * \pi * [\cos(\pi * (x - vt)) + \cos(\pi * (x + vt))]$$

## *Problem 3*

3a)



3b)

Increasing dt = dx results in the numeric solution becoming unstable and rapidly oscillating.