Solving PDE

Report

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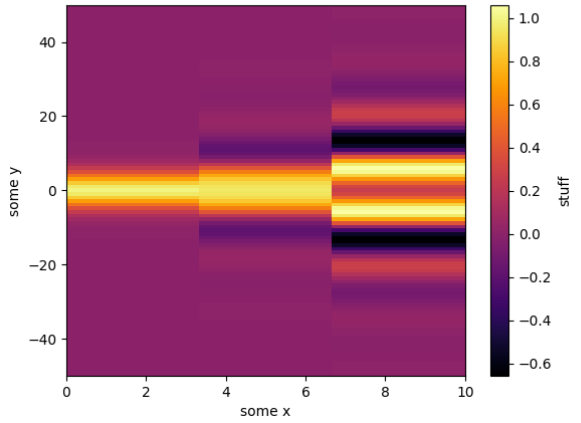
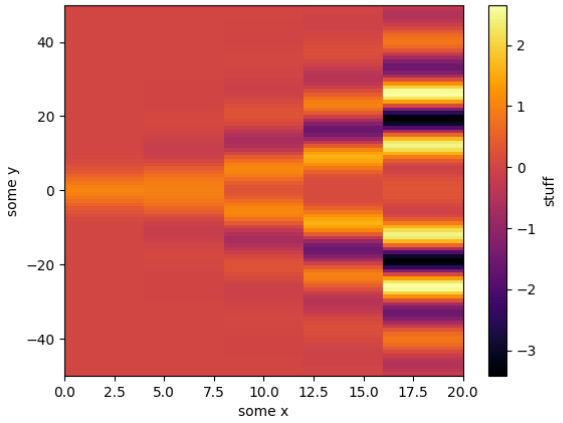
Contents

1 $x \in [0100], hx = 5 and y \in [-50, 50], hy = 1$

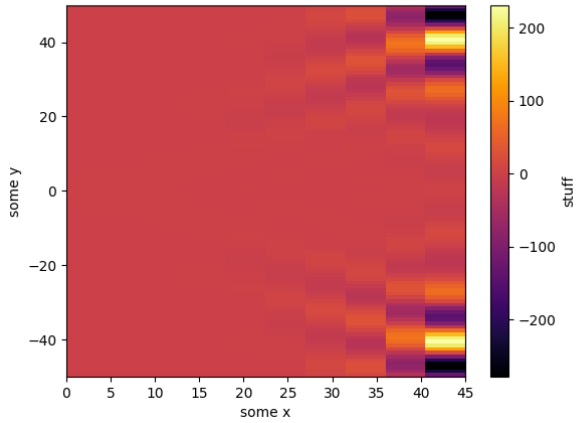
1.1 Heatmap



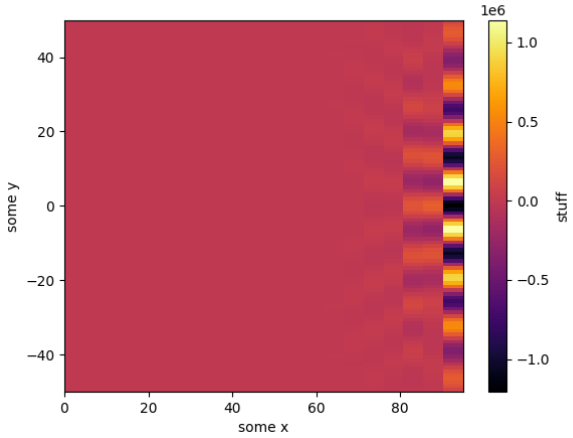
(a) 0-3



(b) 0-5



(c) 0-10



(d) 0-20

Figure 1: Heatmap for first n x numerically calculated

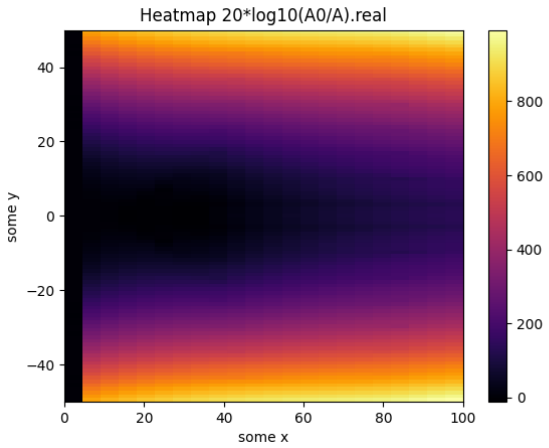


Figure 2: numerical solution

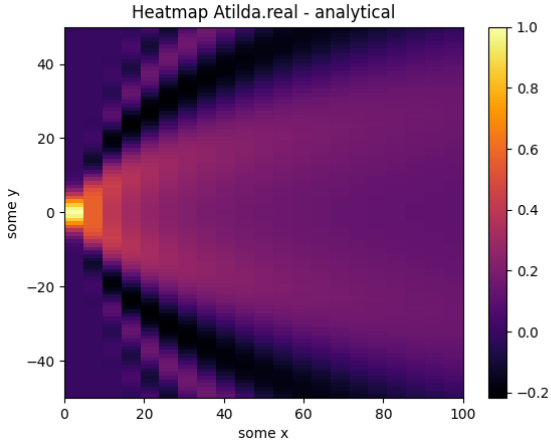
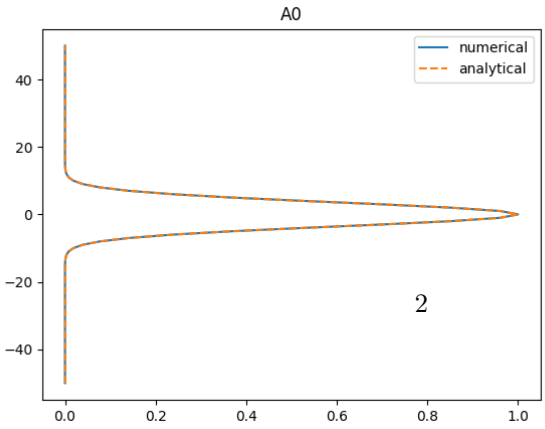
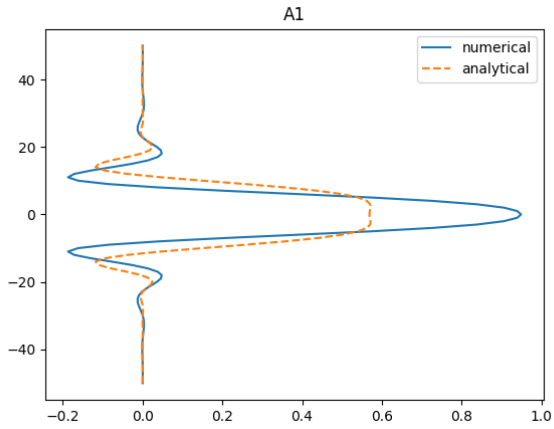


Figure 3: analytical solution

1.2 Compare numerical and analytical



(a) x=0

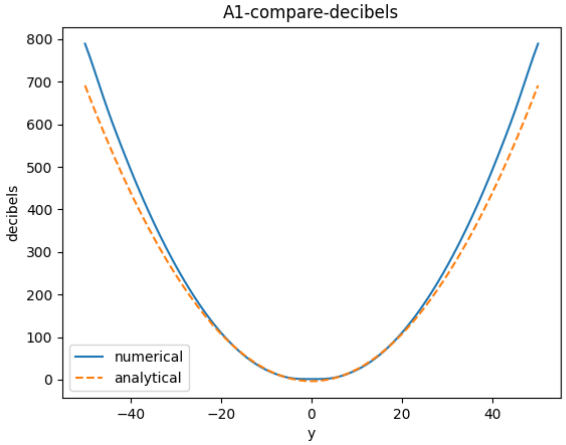


(b) x=1

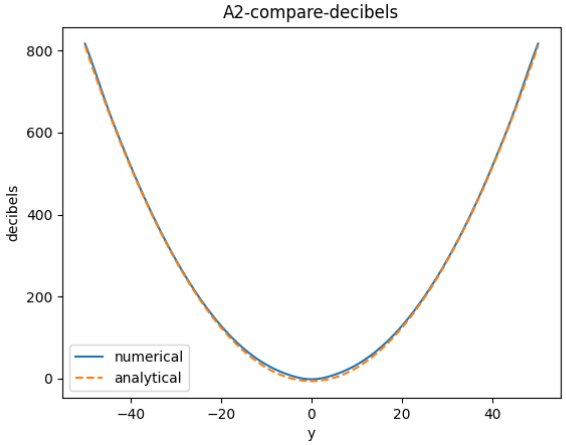
1.3 Compare numerical and analytical - decibels

Functon for converting to decibels:

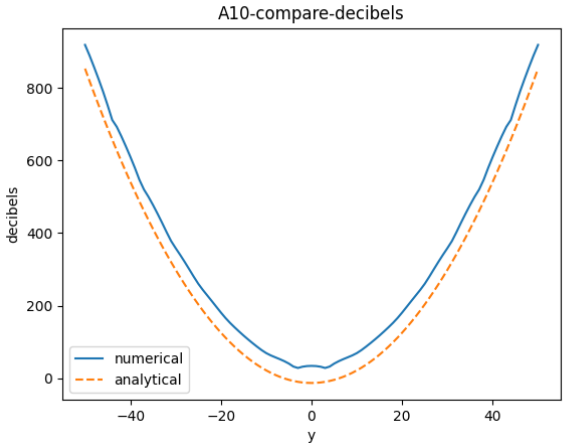
```
''' Function takes a vector (matrix row) and transfores the
                                    quantity to decibels '''
def convert_to_decibel(x):
    a0 = x[0]
    new = []
    for i in x:
        if cmath.log10(i/a0) == 0:
            new = new + [1]
        else:
            new = new +  [20*cmath.log10(i/a0)]
    return new
```



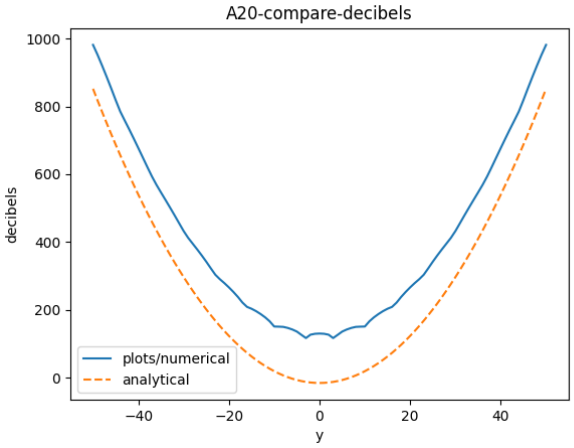
(a) x=1



(b) x=2



(c) x=3

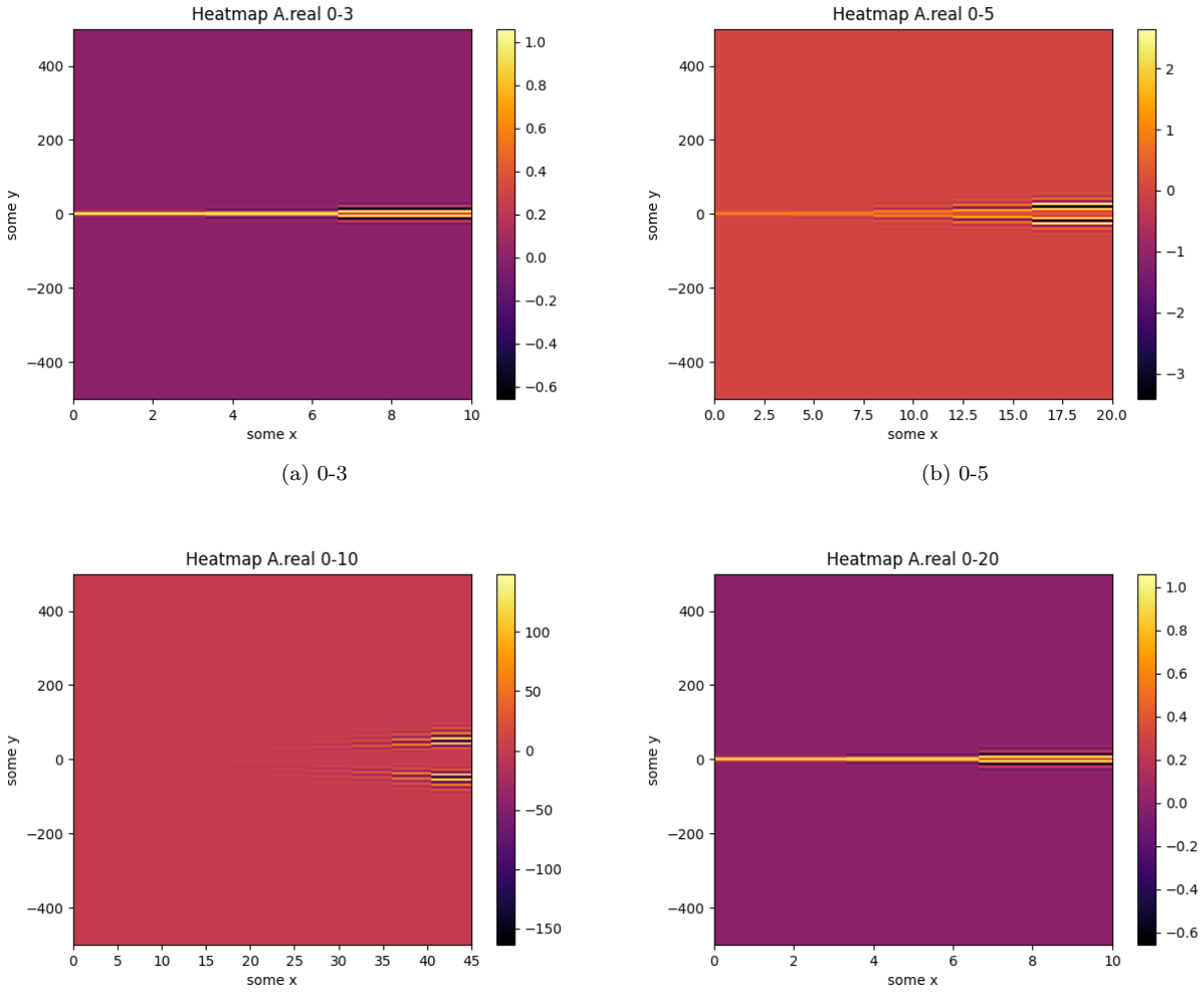


(d) x = 20

Figure 5: x-th column of matrix A (numerical) and $\tilde{A}$ (analytical) converted to decibels

2 $x \in [01000], hx = 5 and y \in [-500, 500], hy = 1$

2.1 Heatmap



(a) 0-3

(b) 0-5

(c) 0-10

(d) 0-20

Figure 6: Heatmap for first n x numerically calculated

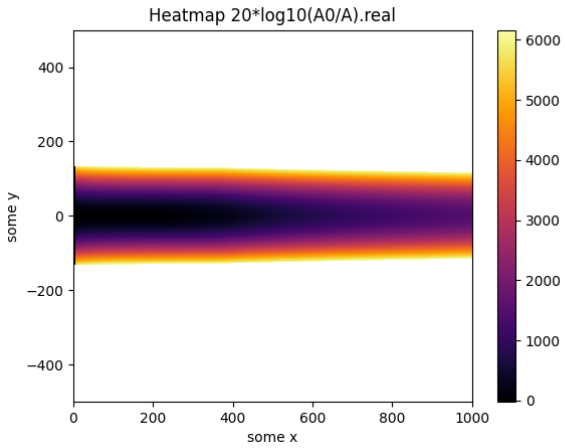


Figure 7: numerical solution

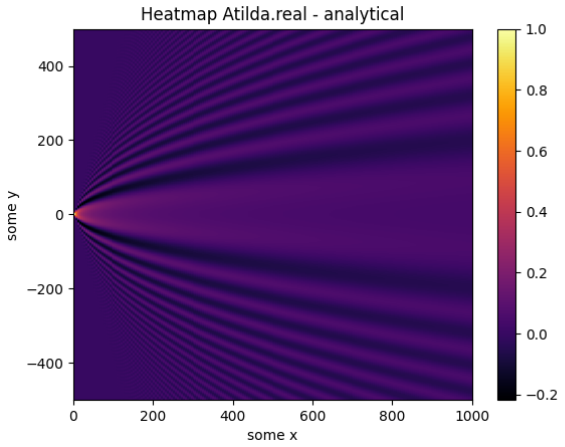
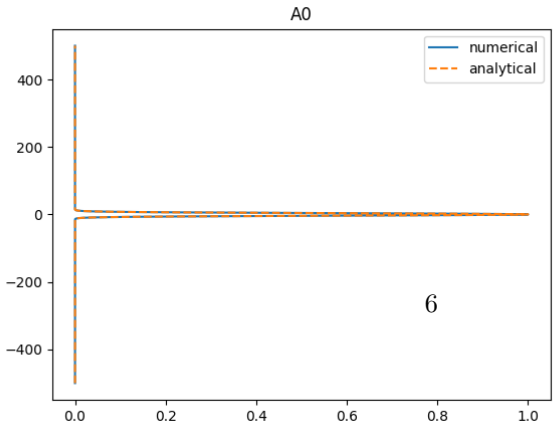
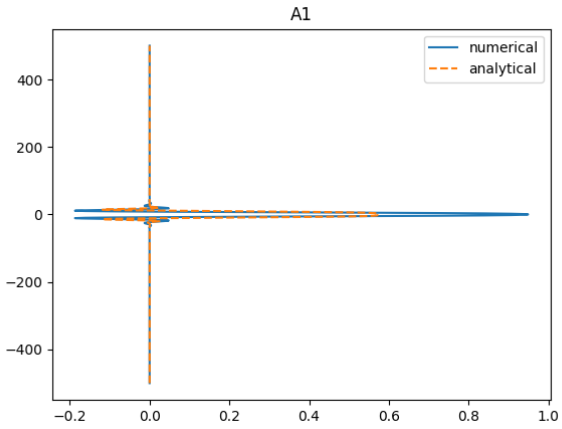


Figure 8: analytical solution

2.2 Compare numerical and analytical



(a) x=0



(b) x=1

2.3 Compare numerical and analytical - decibels

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        else:
            new = new +  [20*cmath.log10(i/a0)]
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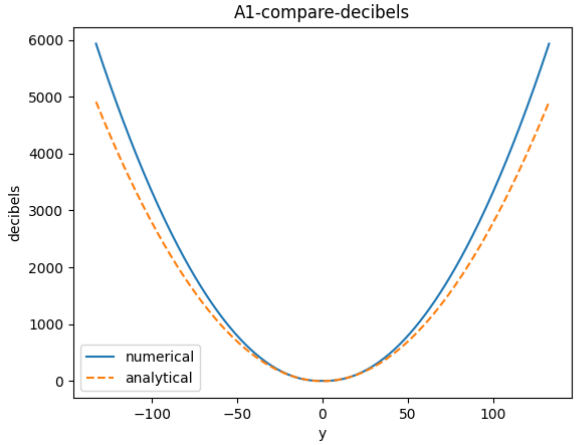
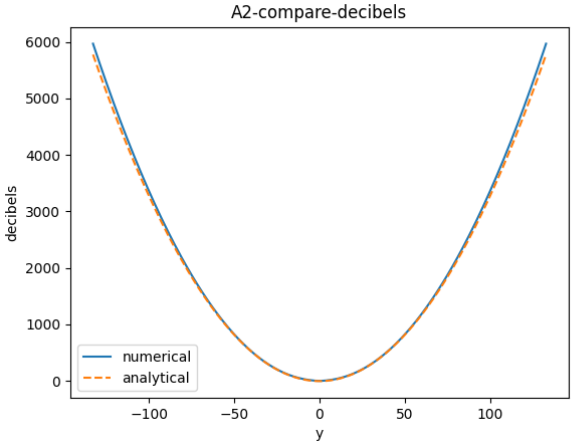
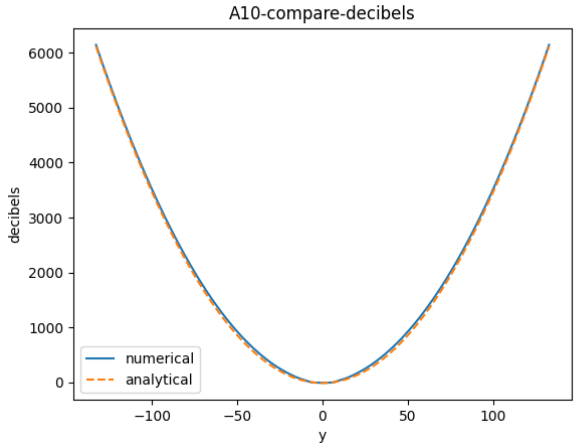


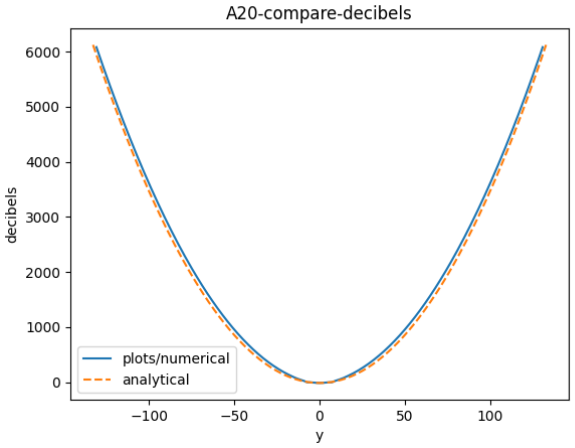
(a) x=1



(b) x=2



(c) x=3



(d) x = 20

Figure 10: x-th column of matrix A (numerical) and $\tilde{A}$ (analytical) converted to decibels