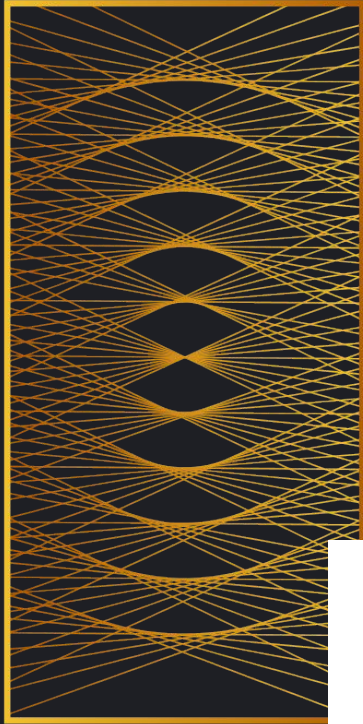


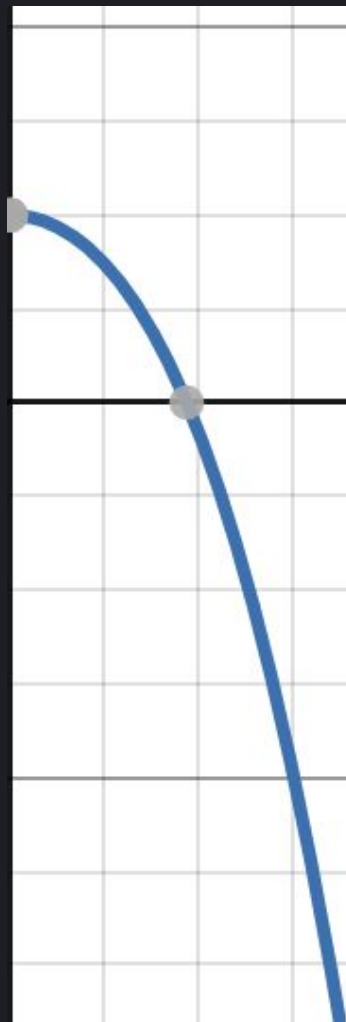
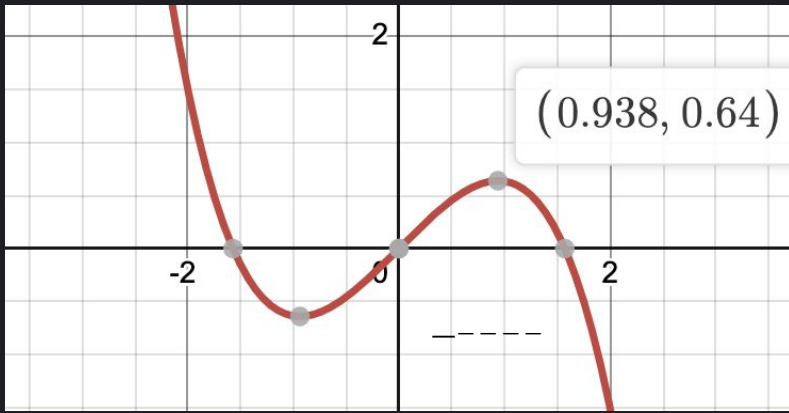
# 01.

## Derivative of a Function

$$f(x) = \cos(x) \sinh(a \cdot x)$$

:  $0 \leq x \leq \pi / 2$ . Here  $a$  is a parameter.





Root is  
at .938



03

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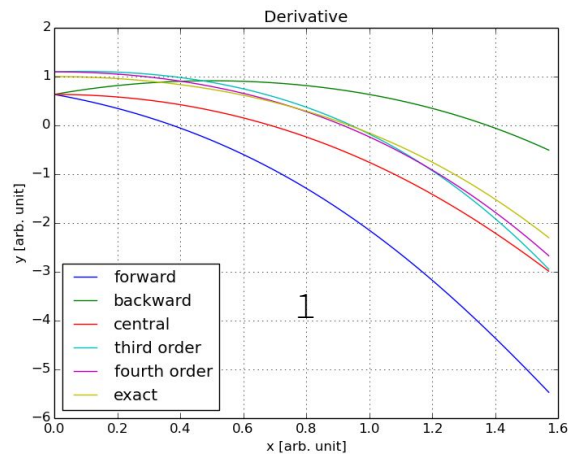
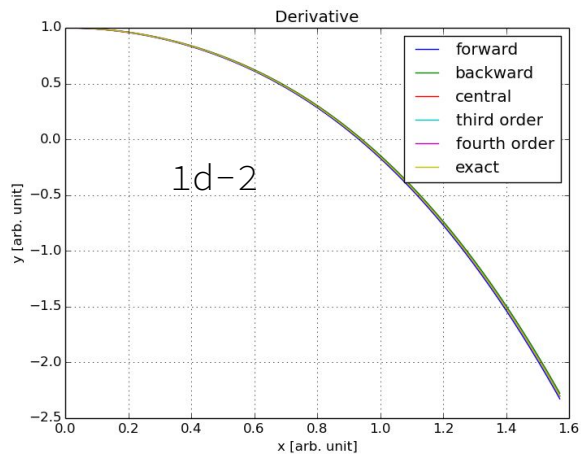
02

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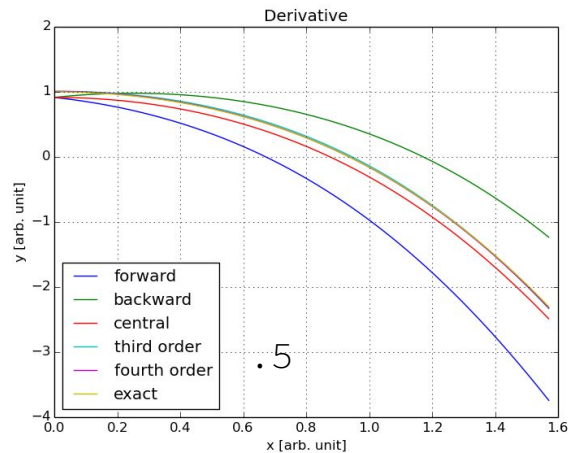
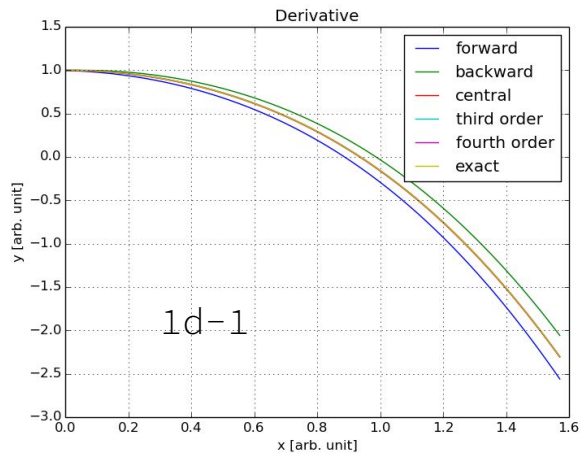
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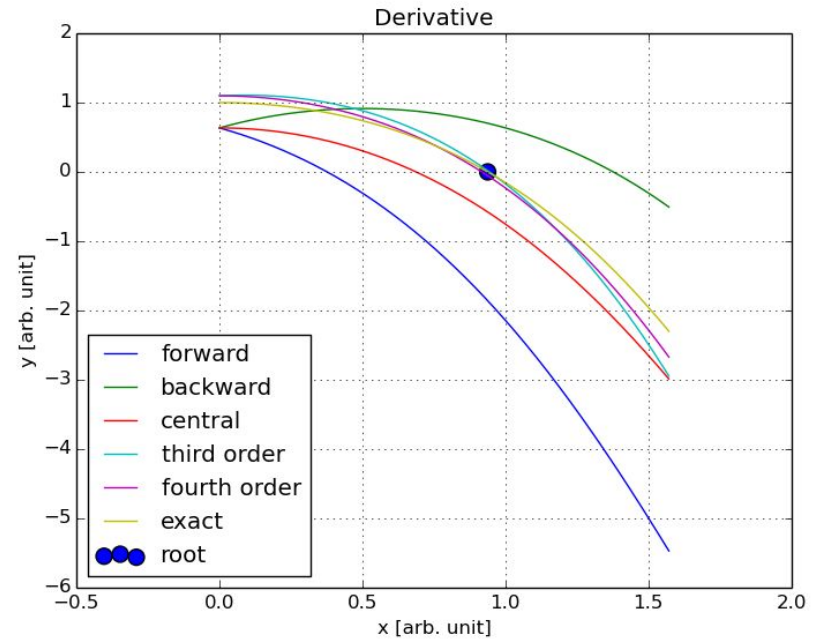
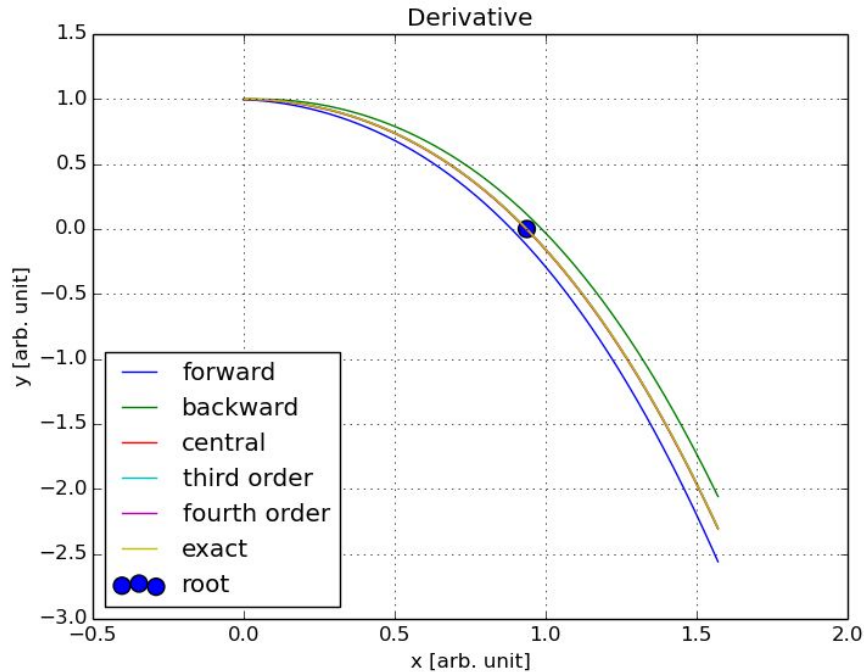
Y here is the  
first  
derivative of  
 $f(x)$



a)



b)



0.93755203435598067

 $h=1d-2$ 

$h$  does not play any part to the value of root since we are using the exact derivative to find. In reality, root will change if we use other methods.



1	1.1780972450962968
2	0.98174770424689151
3	0.88357293382218882
4	0.93258177921820040
5	0.95708620191620619
6	0.94483399056720330
7	0.93870788489270185
8	0.93556629223911136
9	0.93399549591231612
10	0.93478089407571374

-77156

$$H = 1d-1$$

$$h=1d-3$$

1	1.1780972450962968
2	0.98174770424689151
3	0.88357293382218882
4	0.93258177921820040
5	0.95708620191620619
6	0.94483399056720330
7	0.93870788489270185
8	0.93556629223911136
9	0.93713708856590661
10	0.93792248672930423

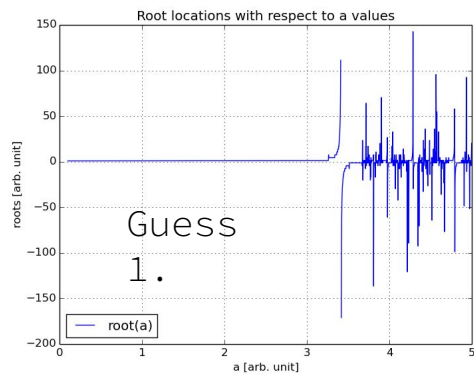
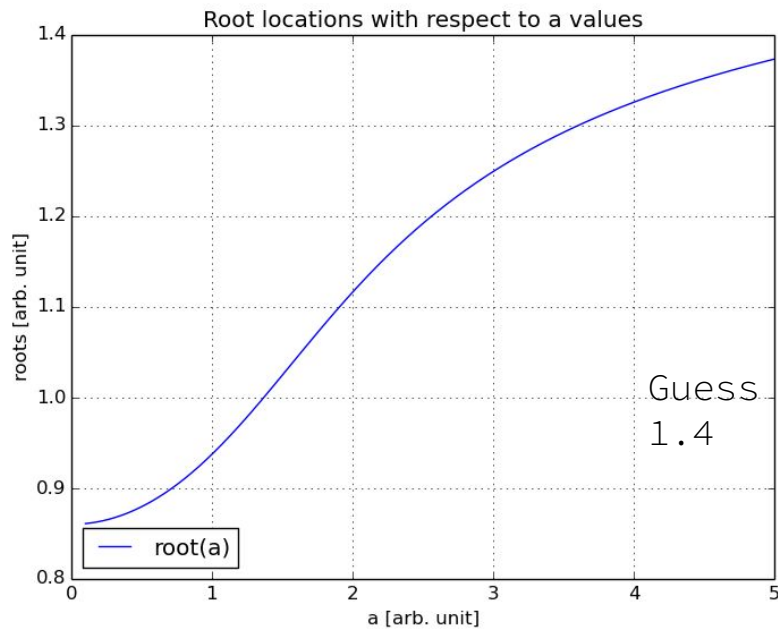
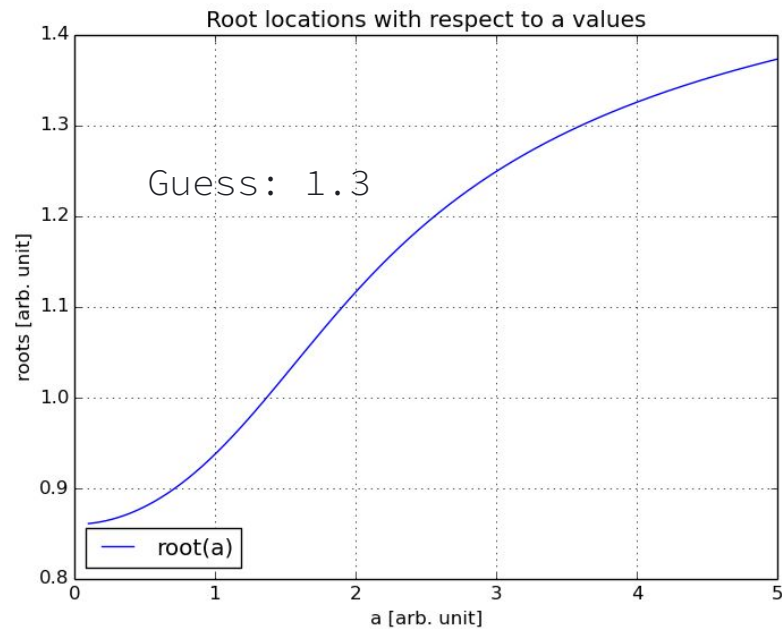
1	1.1780972450962968
2	0.98174770424689151
3	0.88357293382218882
4	0.83440700879349772
5	0.85891143149150351
6	0.87116364284050640
7	0.87728974851500785
8	0.87414815586141736
9	0.87571895218821261
10	0.87650435035161023

$$h=.5$$

Now, h plays an important part for the value of root

c)





003-1040559

1250 003-77156.8

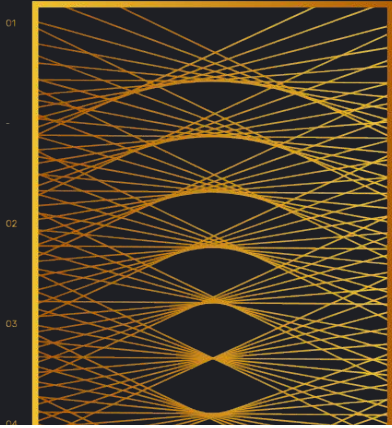
1760 0009-14563.7

73273

# Conclusion

Given a bad initial guess might  
give noisy data





# 02.

$$f(x) = \log_{10}(\cosh(x)),$$

$-3 \leq x \leq 3$ . Analytical answer is  $x = 0$ .

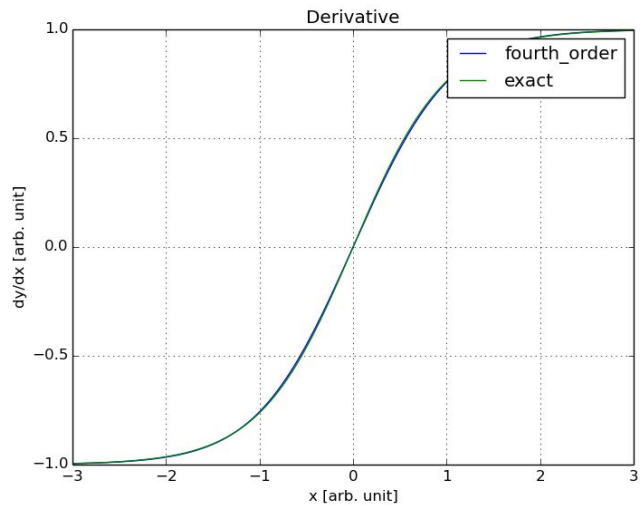


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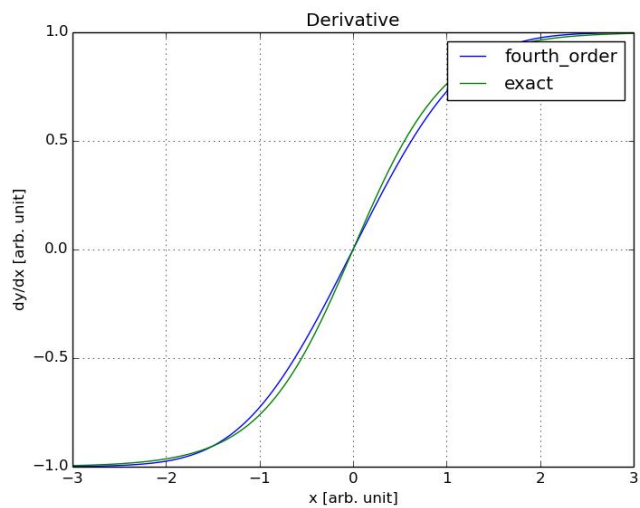
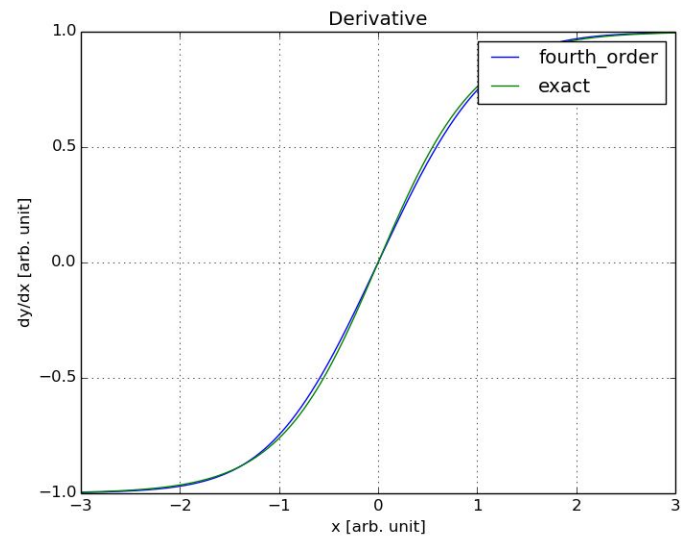




$h = .6$

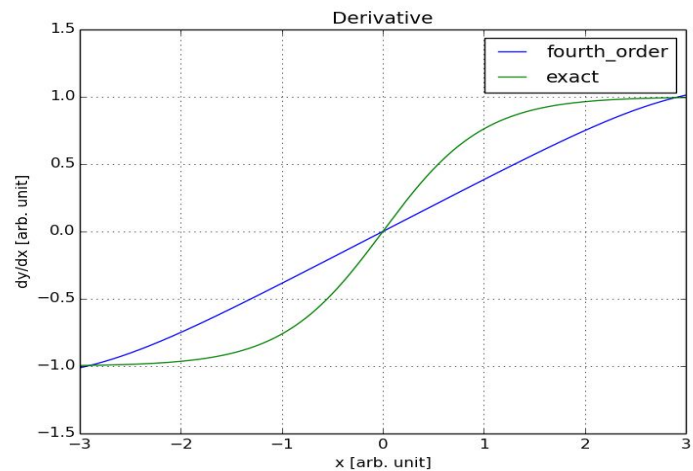
$h = .8$

a)



$h = 1$

$h = 3.1$



```

1 -0.16667954776824023
2 -2.4659541853296107E-002
3 -5.9804221070743069E-004
4 -3.5751186954846668E-007
5 -1.2781470639551404E-013
6 -1.6357819730662901E-026
7 0.00000000000000000
8 0.00000000000000000

```

IG = -1

```

1 -0.65227938473694091
2 -0.26226350361455281
3 -5.6779112365682283E-002
4 -3.1005846276210211E-003
5 -9.5937379716221939E-006
6 -9.2039219597349017E-011
7 -8.4712212766409121E-021
8 0.00000000000000000
9 0.00000000000000000

```

Ig = -2

```

1 -1.3091424301930012
2 -0.70699439175977630
3 -0.29647502805807668
4 -7.0681320265443770E-002
5 -4.7576984933433430E-003
6 -2.2563815785375634E-005
7 -5.0911812420517850E-010
8 -2.5920128424413056E-019
9 0.00000000000000000
10 0.00000000000000000

```

ig=-3

```

1 0.00000000000000000

```

b)



003-1040559

1250 003-77156.8

1760 0009-14563.7

73273

# Conclusion

The function converges pretty  
quickly given initial guess from  
-3 to 3





# 03

## COVID-19

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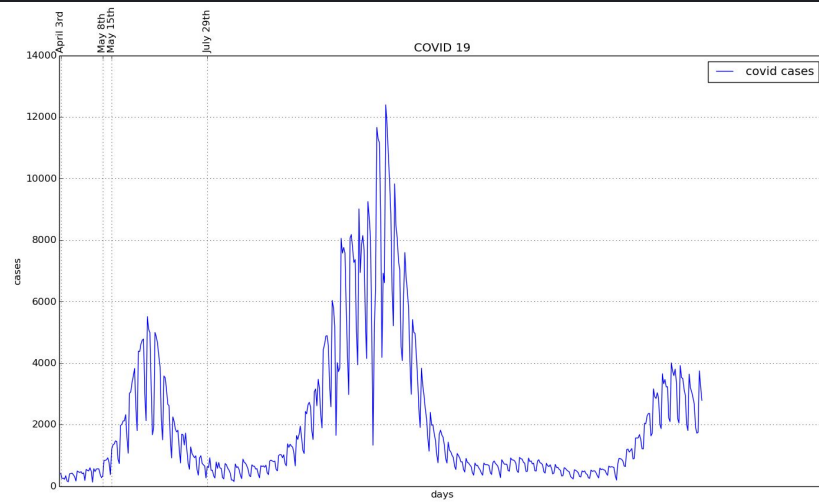
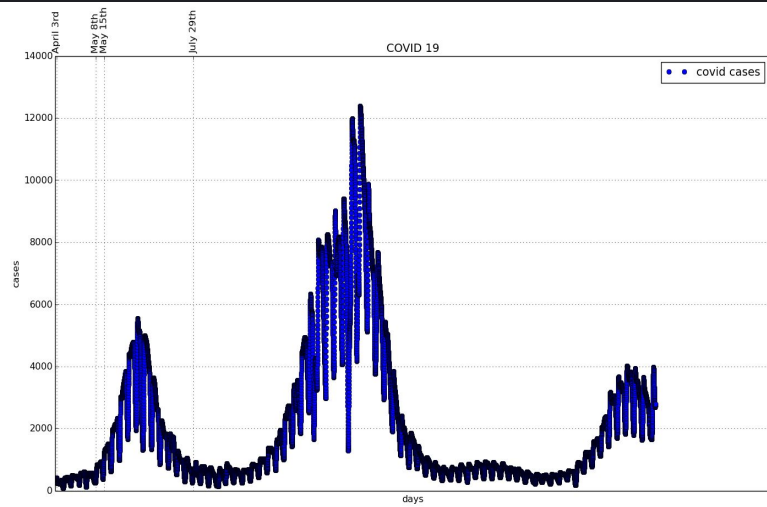
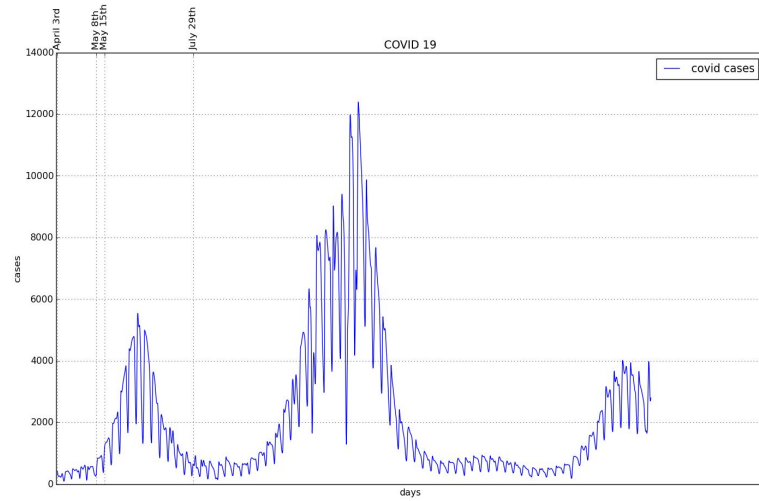
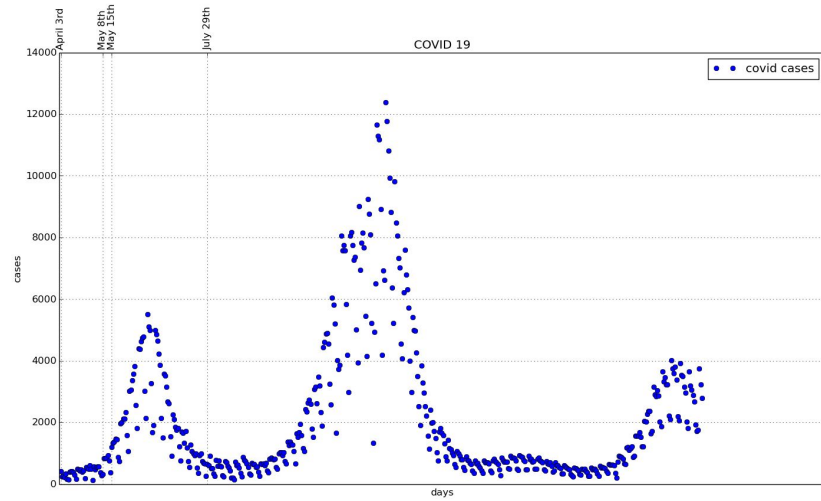
03

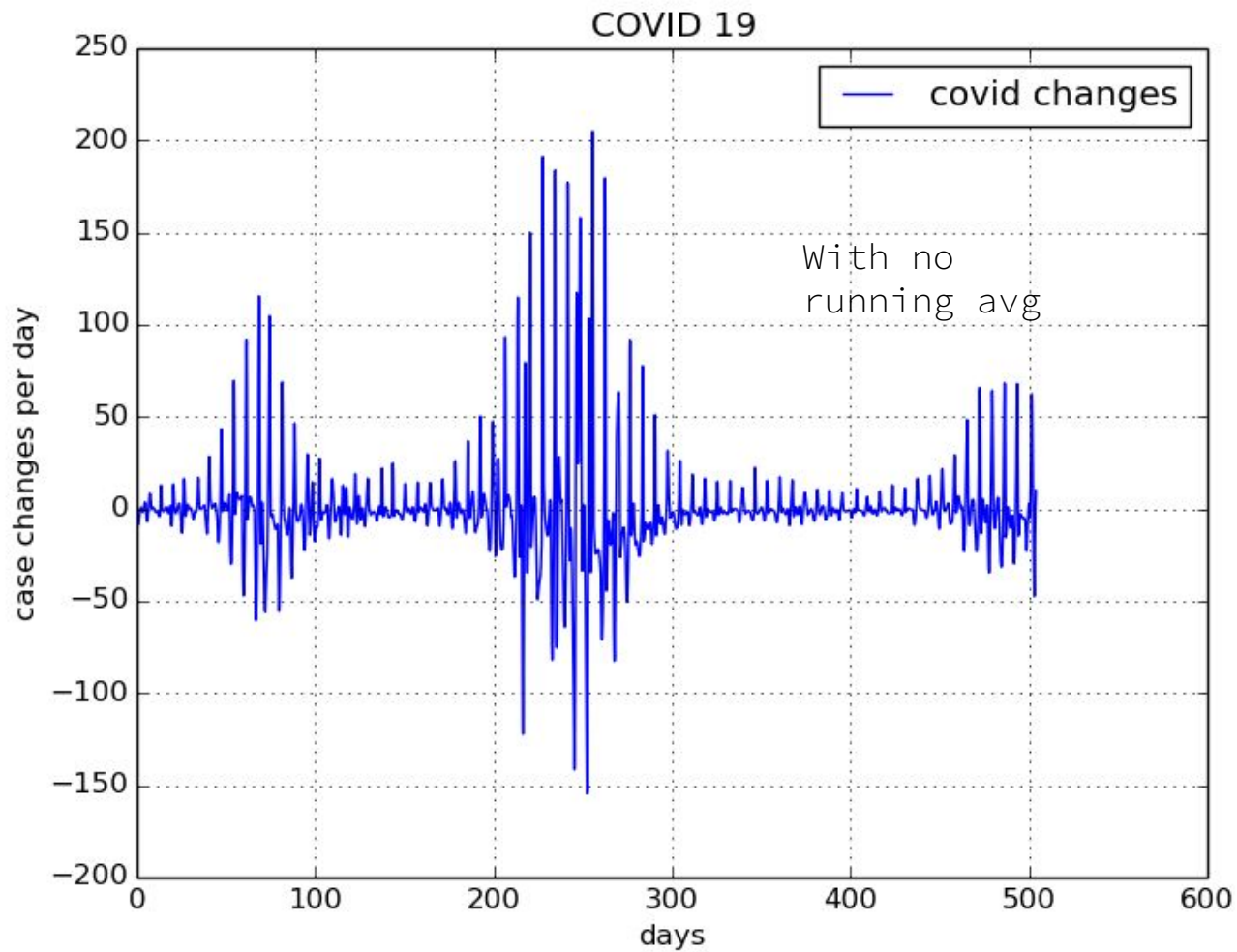
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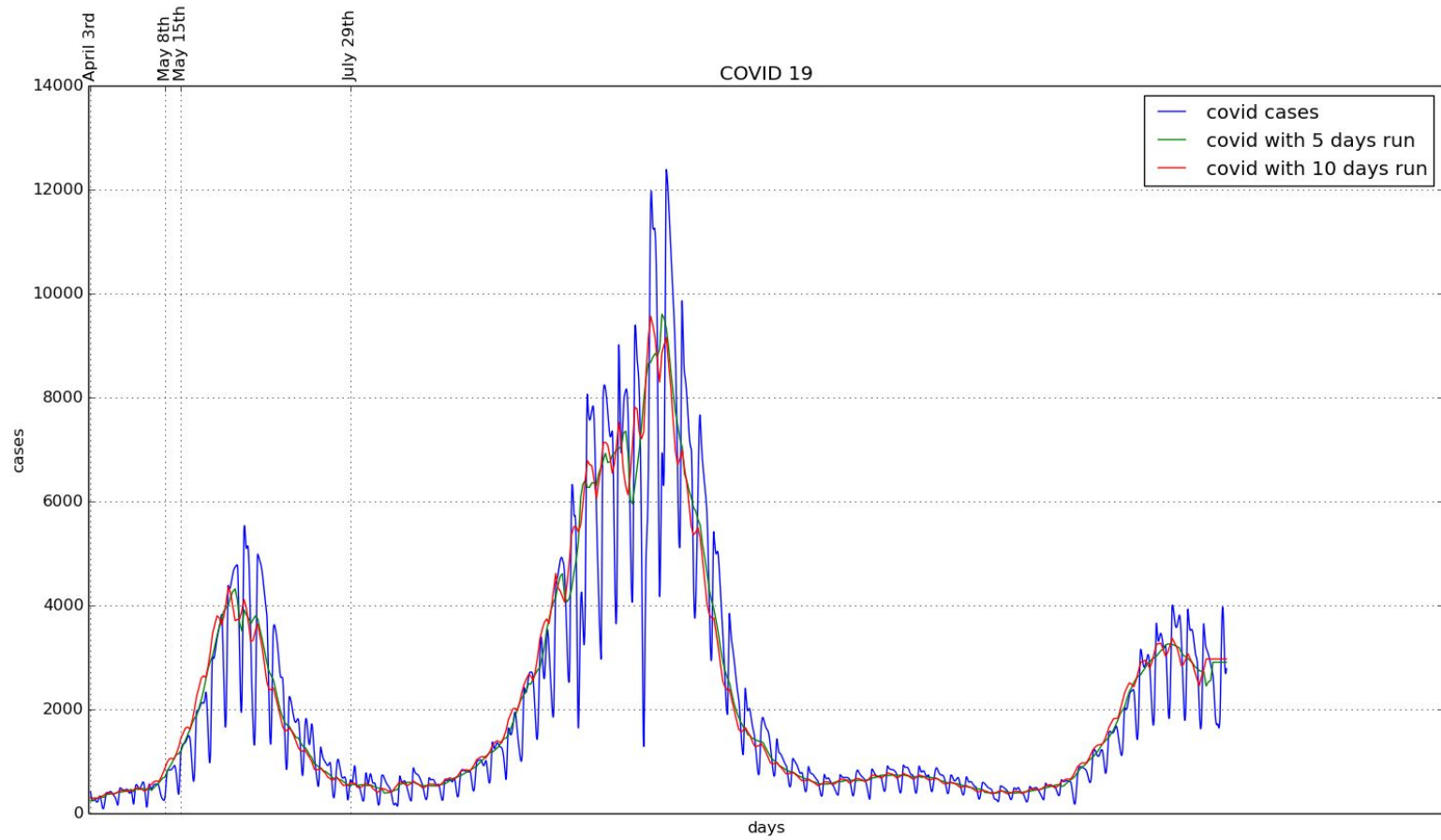
05

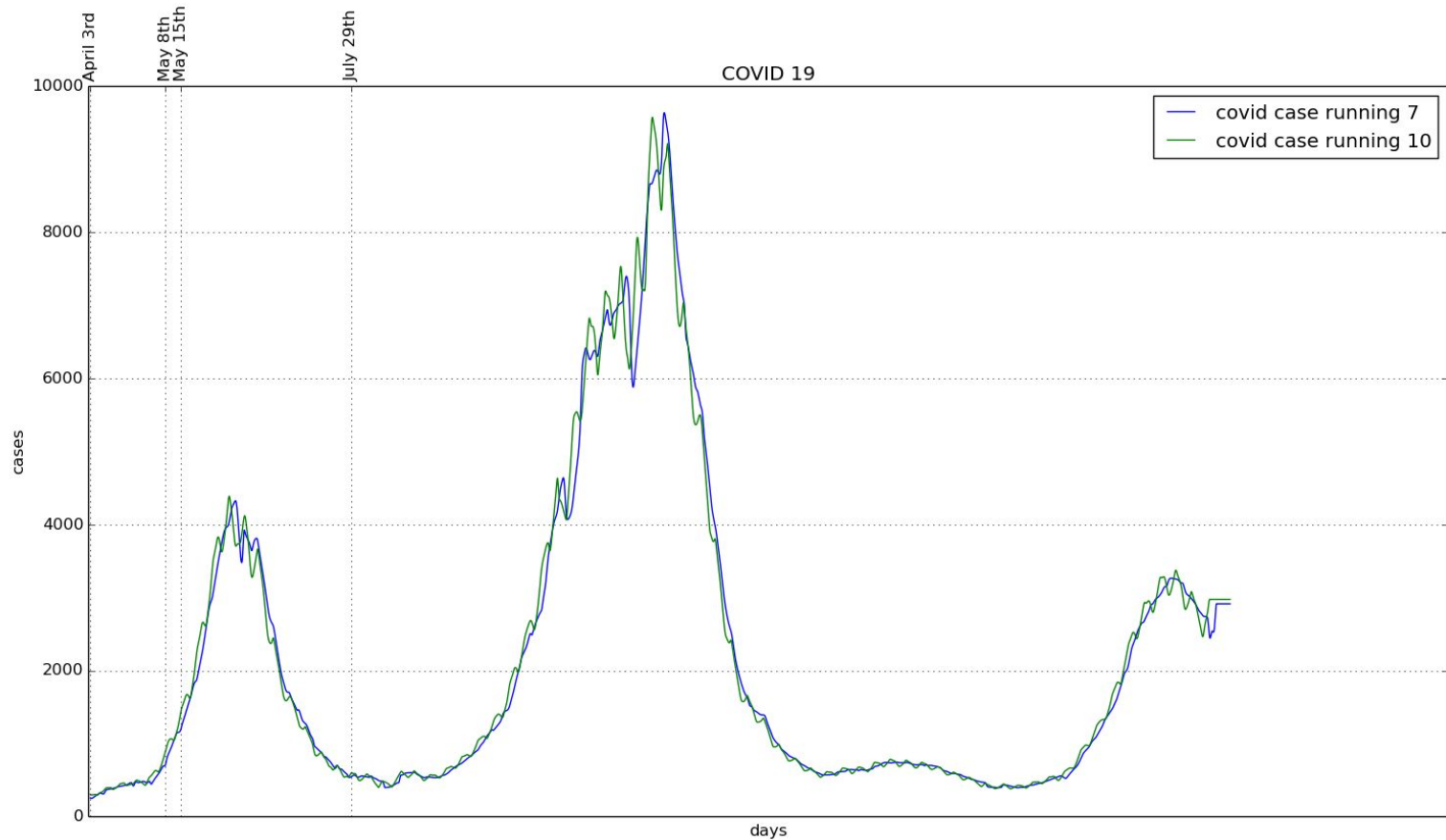
06

04

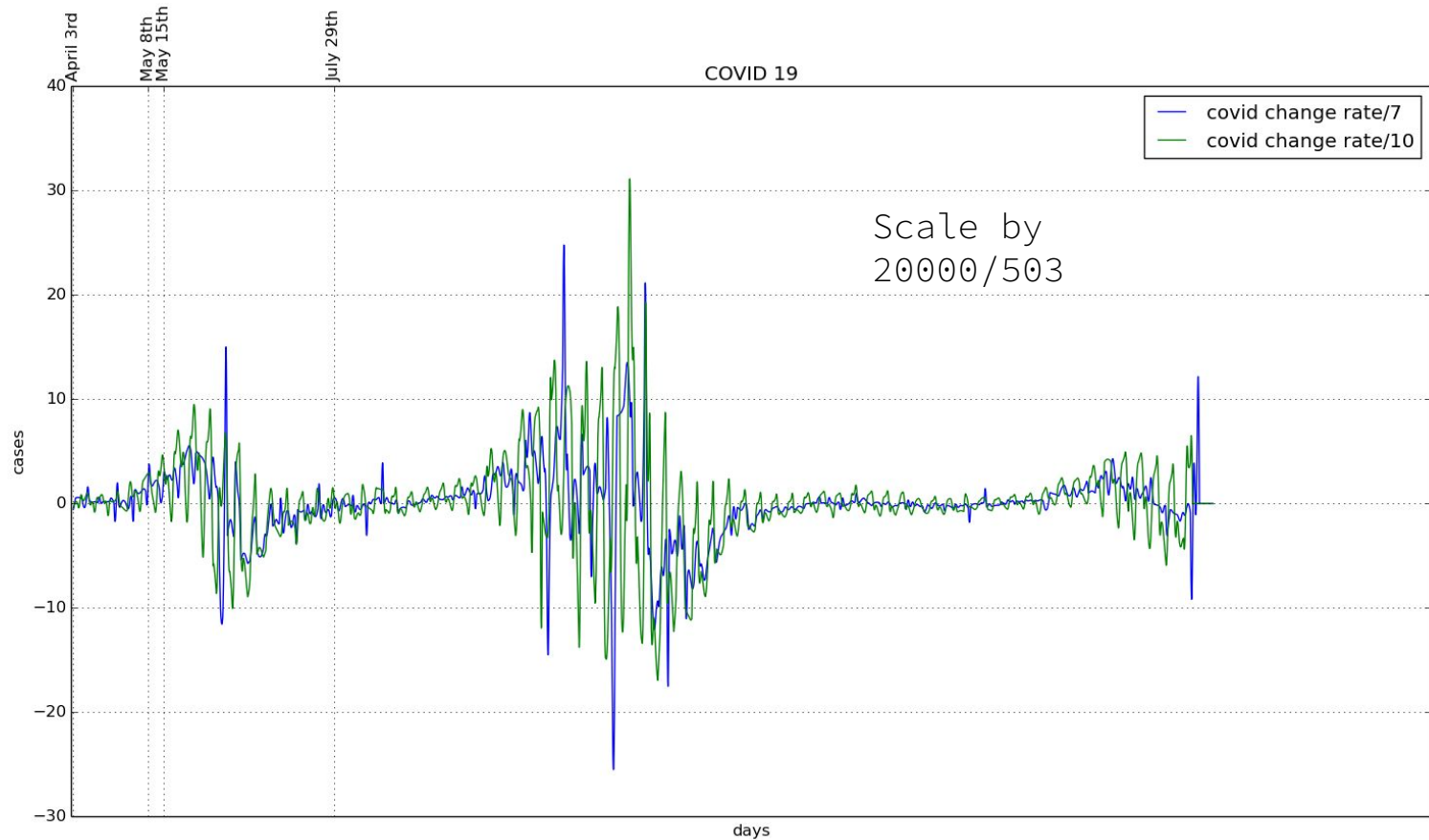
05

06









01

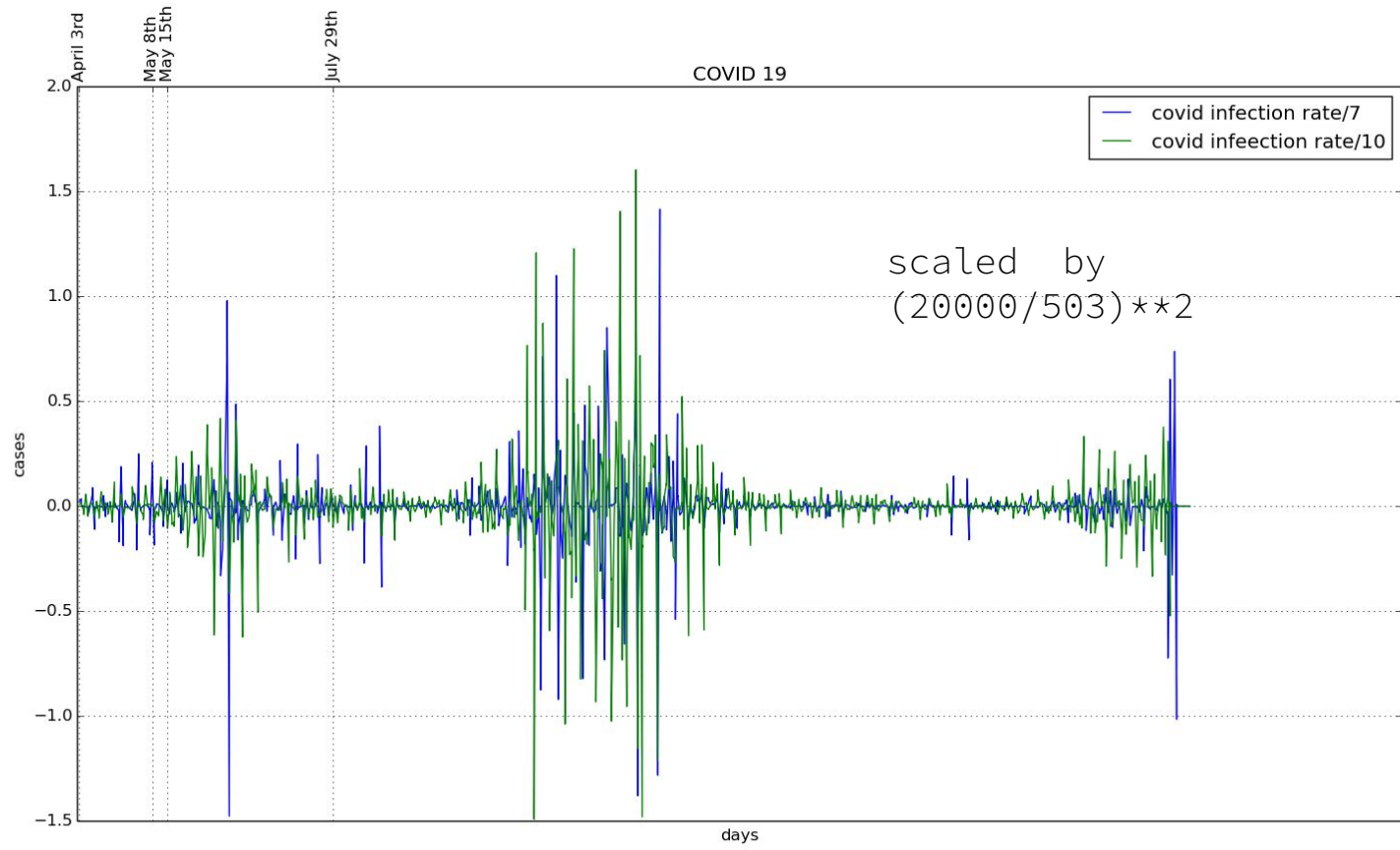
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