18/ENG04/013

NAME: AMADI-DURU, C. Melvin

$\frac{dm}{dt} = m_{in} - m_{out}$

each gallon contains $(1+\sin t)$ lb

50 gal of mixed inside

Hence $m_{in} = 50.(1+\sin t)$

rate of going out = 30 gl/min

total amount = 1200

$y_{out} = \frac{30}{1200} = 0.025 \frac{lb}{gal}\, m$

(a)

$\frac{dm}{dt} = 50(1+\sin t) - 0.025m$

ordinary diff eqn for studying the dynamics of amount of salt

$\boxed{\frac{dm}{dt} = -0.025m + 50(1+\sin t)}$

$\frac{dm}{dt} + Pm = Q \quad , P = 0.025 \quad , Q = 50(1+\sin t)$

$IF = \int P\,dt = \int 0.025 = 0.025t = e^{0.025t}$ Let $e^{0.025} = e^{t/40}$

$\boxed{m \cdot IF = \int Q \cdot IF}$

$m \cdot e^{0.025t} = \int 50(1+\sin t) \cdot e^{0.025t}$

$m \cdot e^{0.025t} = 50 \int e^{0.025t} \cdot (1+\sin t)$

solving RHS

$50 \int e^{0.025t} + e^{0.025t} \sin t = \int 40 e^{\frac{t}{40}} + e^{t/40} \sin t$

using integration by parts for $e^{0.025t} \sin t$

Let $0.025t = t/40$

$fg' = fg - f'g$

where $f = \sin t \quad , g' = e^{t/40}$

$f' = \cos t \quad , g = 40e^{t/40}$

$40e^{t/40}(\sin t) - \int 40 e^{t/40} \cos t$

using integration by parts for $40e^{t/40} \cos t$

$f = \cos(t)$ $g' = 40e^{t/40}$

$f' = -\sin(t)$, $g = 1600e^{t/40}$

$40e^{t/40}\sin(t) - \left(1600e^{t/40}\cos(t) - \int -1600e^{t/40}\sin(t)\,dt\right)$

$40e^{t/40}\sin(t) - 1600e^{t/40}\cos(t) - 1600\int e^{t/40}\sin(t)$

$\int e^{t/40}\sin(t) = 40e^{t/40}\sin(t) - 1600e^{t/40}(\cos t) - 1600\int e^{t/40}\sin(t)$

make $\int e^{t/40}\sin(t)$ subject

$\int e^{t/40}\sin(t) + 1600\int e^{t/40}\sin(t) = 40e^{t/40}\sin(t) - 1600e^{t/40}(\cos t)$

$1601\int e^{t/40}\sin(t) = 40e^{t/40}\sin(t) - 1600e^{t/40}\cos(t)$

$\int e^{t/40}\sin(t) = \dfrac{40e^{t/40}\sin(t) - 1600e^{t/40}\cos(t)}{1601}$

from $50\int 0.025e^{0.025t} + e^{0.025t}(\sin t)' + C$

$m \cdot e^{t/40} = 50\left(\dfrac{40e^{t/40}}{1} + \dfrac{40e^{t/40}\sin(t) - 1600e^{t/40}\cos(t)}{1601}\right) + C$

$m \cdot e^{t/40} = 50\left(\dfrac{64040e^{t/40} + 40e^{t/40}\sin(t) - 1600e^{t/40}\cos(t)}{1601}\right) + C$

$m \cdot e^{t/40} = \dfrac{3202000e^{t/40} + 2000e^{t/40}\sin(t) - 80000e^{t/40}\cos(t)}{1601} + C$

~~$m \cdot e^{t/40} = 20$~~ Divide each by 1601 on RHS

$m \cdot e^{t/40} = 2000e^{t/40} + 1.25e^{t/40}\sin(t) - 50e^{t/40}\cos(t) + C$

Divide both sides by $e^{t/40}$

$m = 2000e^{t/40} + 1.25e^{t/40}\sin(t) - 50e^{t/40}\cos(t) + Ce^{-t/40}$

when $m = 150$, $t = 0$

$150 = 2000 - 50 + C$

$150 = 1950 + C$

$C = -1800$

$m = 2000e^{t/40} + \dfrac{2000e^{t/40}\sin(t)}{1601} - \dfrac{80000e^{t/40}\cos(t)}{1601} - 1800e^{-t/40}$ //

$t = 0$, when

$$m = 2000 + \frac{2000\sin(t)}{1601} - \frac{80{,}000\cos(t)}{1601} - 1800e^{-t/40}$$

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- bolk.xlsx
- bomn.xlsx
- bor.xlsx
- bosr.xlsx
- classwork1.m
- classworkextra.m

Details

Workspace

Name	Value
ax	1x1 Axes
G	1x1 sym
Gf	1x901 sym
t	1x901 double

Editor - C:\Users\domin\Documents\MATLAB\HW1.m

```
1  -    commandwindow
2  -    clear
3  -    clc
4  -    close all
5  -    syms t
6  -    t=0:0.5:450
7  -    G=dsolve('Dm+(0.025*m)=50*(1+sin(t))','m(0)=150')
8  -    Gf=subs(G,t)
9  -    plot(t,Gf)
10 -    title('Dynamic response of the system by Melvin Amadi')
11 -    xlabel('Time taken (min)')
12 -    ylabel('Response of solution')
13 -    grid on
14 -    grid minor
15 -    ax = gca;
16 -    ax.FontSize = 13;
```

+5

- modelling1.m
- mathtest4c.m
- nomso4a.m
- nigger.m
- nomso4c.m
- PRACTICE.m
- AMADO.m
- melvinamadii.m
- assignment3.m
- classworkextra.m
- serious.m
- sympref.m
- HW1.m
- proper.m
- runner.m
- datinggg.m

Command Window

```
Gf =

[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1601 - (2881850*exp(-1/80))/1601, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1)).

fx >>
```

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```

Figure 1

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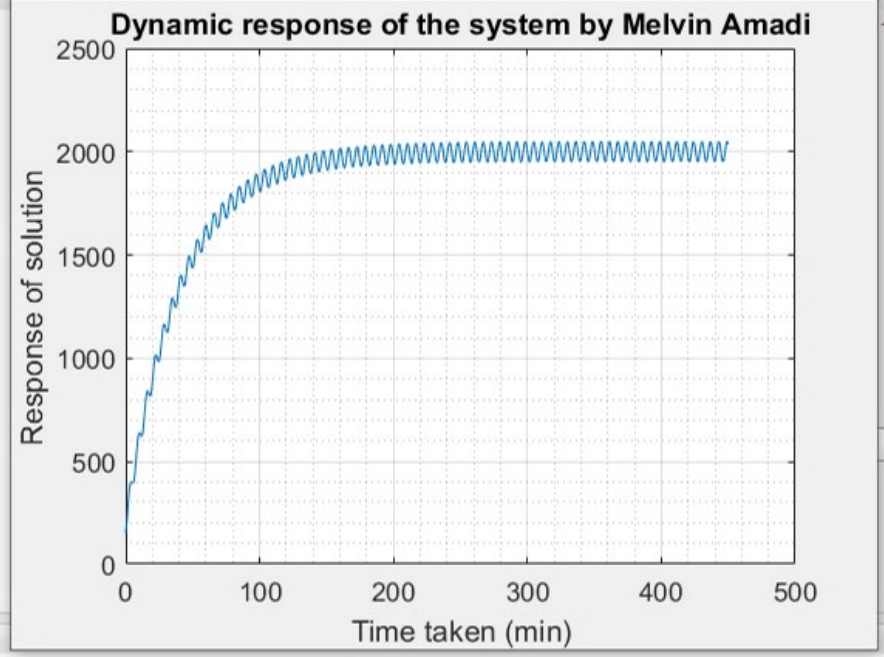

Command Window

```
Gf =

[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1601 - (2881850*exp(-1/80))/1601, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1)).
fx >>
```

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Details

Workspace

Name	Value
ax	1x1 Axes
G	1x1 sym
Gf	1x901 sym
t	1x901 double

Editor - C:\Users\domin\Documents\MATLAB\hw2.m

```
1  -    commandwindow
2  -    clear
3  -    clc
4  -    close all
5  -    t1=1:2:499
6  -    t2=0:2:500
7  -    y1=(50/0.05)+(50/1.0025)*sin(t1)+(((50*(0.05))/1.0025)*cos(t1))-802.49*exp(-0.05*t1)
8  -    ym=1000-800*exp(-0.05*t2)
9  -    times=[t1,t2];
10 -    yaxis=[y1,ym];
11 -    plot(times,yaxis)
12 -    title('Dynamic response of the system by Melvin Amadi')
13 -    xlabel('Time taken (min)')
14 -    ylabel('Combined responses')
15 -    grid on
16 -    grid minor
17 -    ax = gca;
18 -    ax.FontSize = 13;
19 -    col_header=['t','V']
20 -    xlswrite('odevbesdata.xlsx',col_header,'veriler')
21 -    xlswrite('odevbesdata.xlsx',t1(:),'veriler','A2:A251')
22 -    xlswrite('odevbesdata.xlsx',y1(:),'veriler','B2:B252')
23 -    xlswrite('odevbesdata.xlsx',t2(:),'veriler','A252:A502')
24 -    xlswrite('odevbesdata.xlsx',ym(:),'veriler','B252:B502')
```

- logarithmic_exponents.m
- melvinmatlab.m
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- mathtest4c.m
- nomso4a.m
- nigger.m
- nomso4c.m
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- serious.m
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Details

Workspace

Name	Value
ax	1x1 Axes
col_header	'tV'
t1	1x250 double
t2	1x251 double
times	1x501 double
y1	1x250 double
yaxis	1x501 double
ym	1x251 double

Editor - C:\Users\domin\Documents\MATLAB\hw2.m

```
1 -  commandwindow
2 -  clear
3 -  clc
4 -  close all
5 -  t1=1:2:499
6 -  t2=0:2:500
7 -  y1=(50/0.05)+(50/1.0025)*sin(t1)+(((50*(0.05))/1.0025)*(
8 -  ym=1000-800*exp(-0.05*t2)
9 -  times=[t1,t2];
10 - yaxis=[y1,ym];
11 - plot(times,yaxis)
12 - title('Dynamic response of the system by Melvin Amadi')
13 - xlabel('Time taken (min)')
14 - ylabel('Combined responses')
15 - grid on
16 - grid minor
17 - ax = gca;
18 - ax.FontSize = 13;
19 - col_header=['t','V']
20 - xlswrite('odevbesdata.xlsx',col_header,'veriler')
21 - xlswrite('odevbesdata.xlsx',t1(:),'veriler','A2:A251')
22 - xlswrite('odevbesdata.xlsx',y1(:),'veriler','B2:B252')
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24 - xlswrite('odevbesdata.xlsx',ym(:),'veriler','B252:B502')
```

Figure 1

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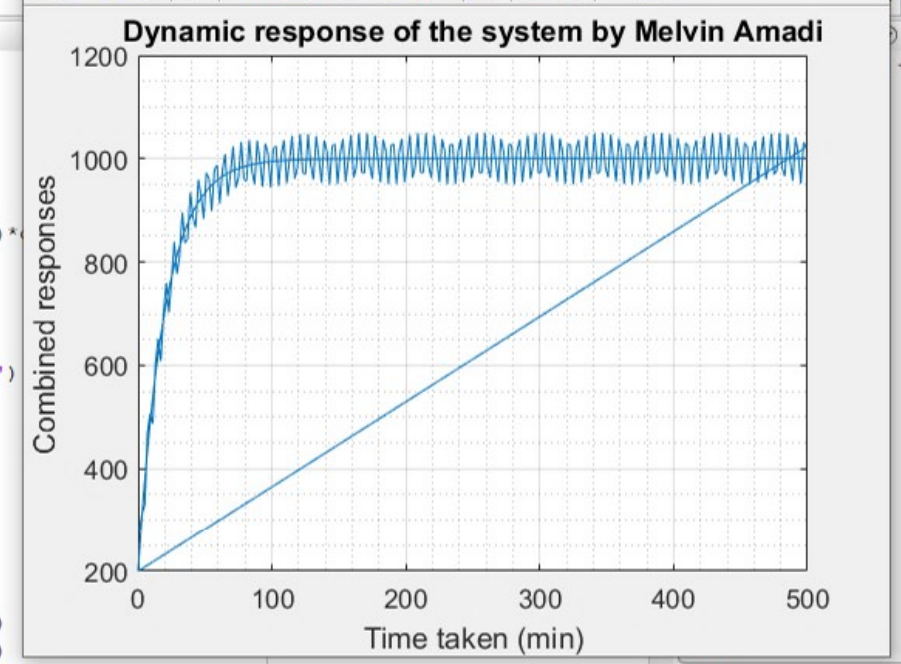

hw2.m

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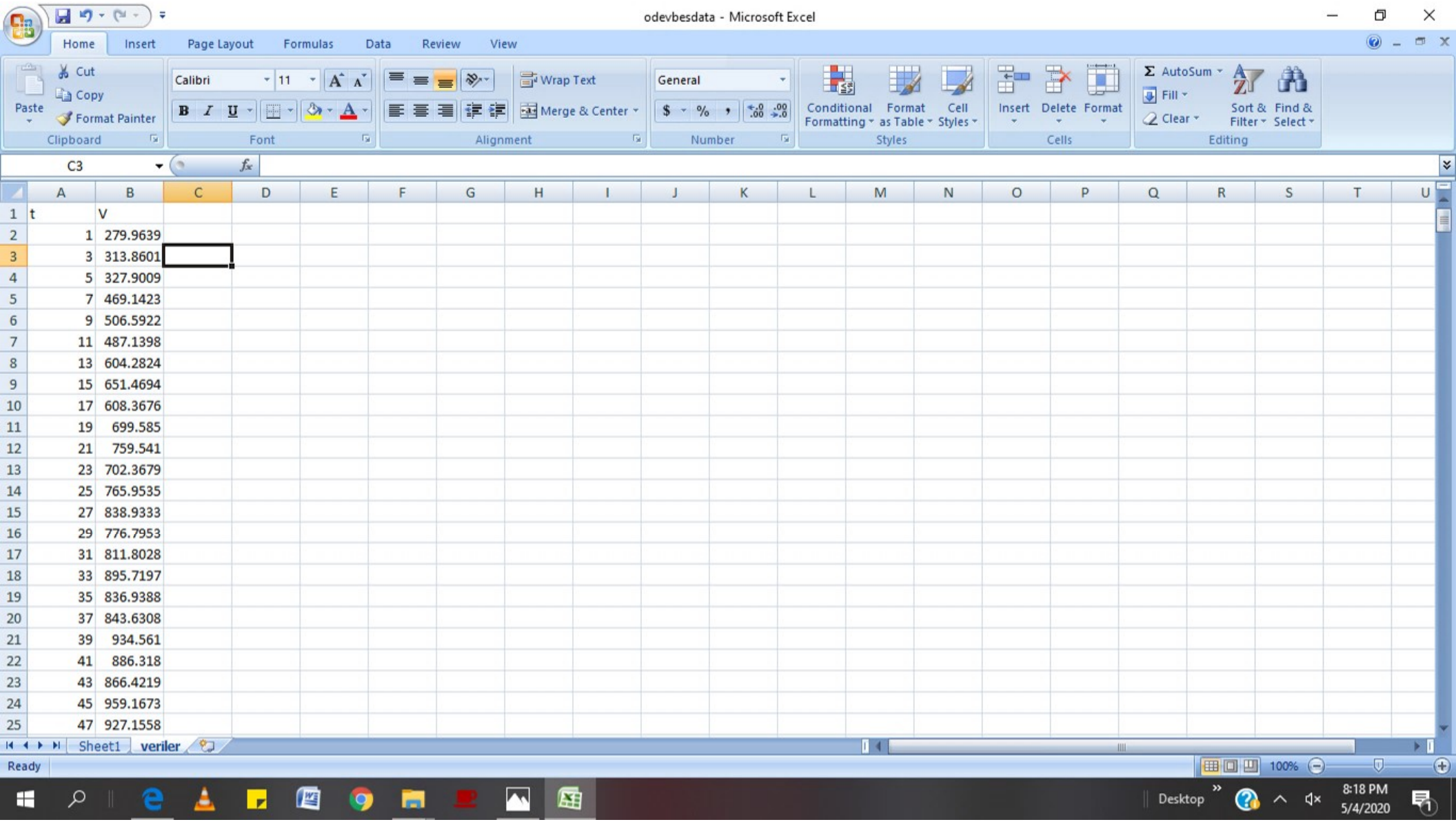
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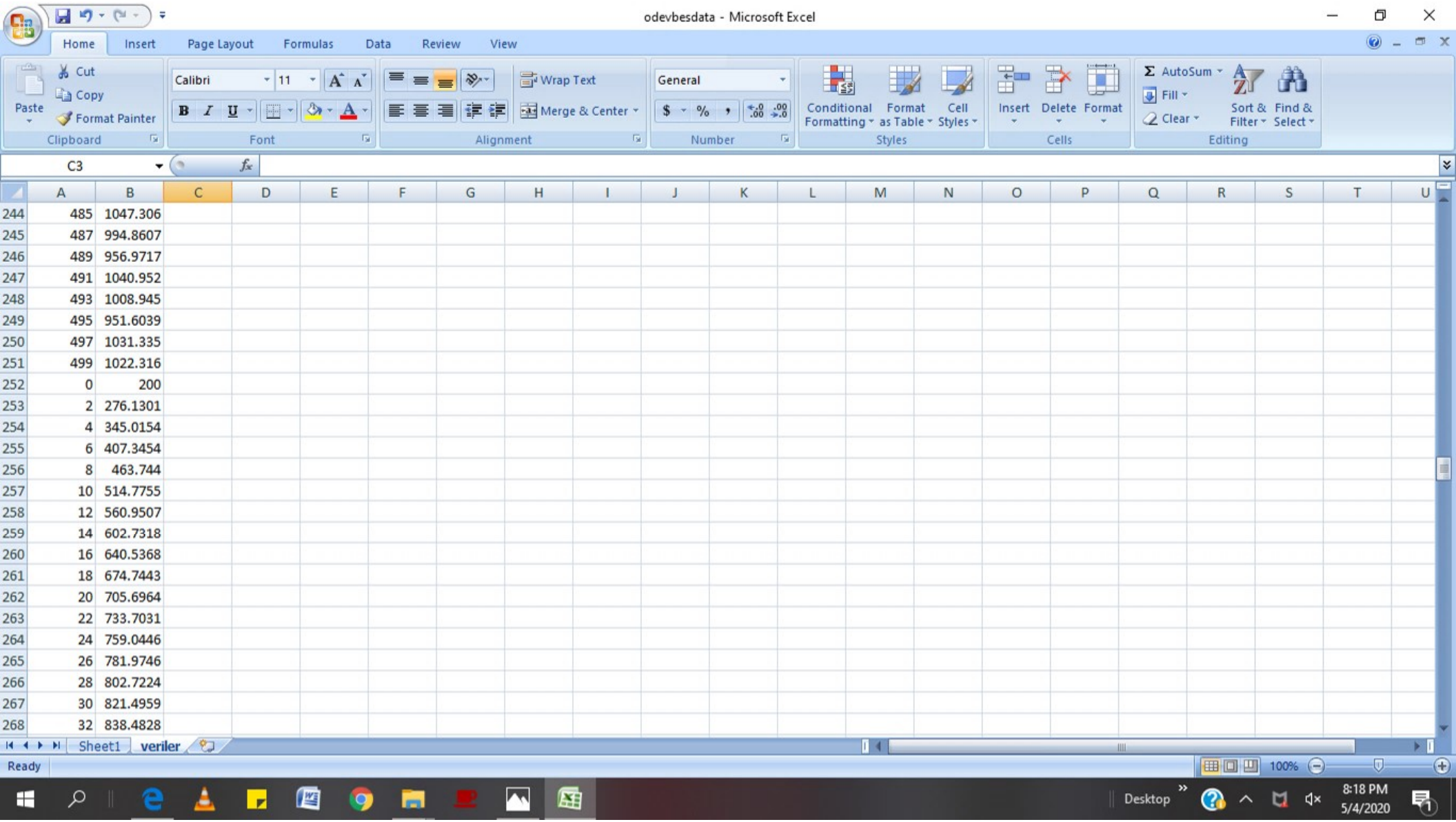
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246 489 956.9717
247 491 1040.952
248 493 1008.945
249 495 951.6039
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251 499 1022.316
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255 6 407.3454
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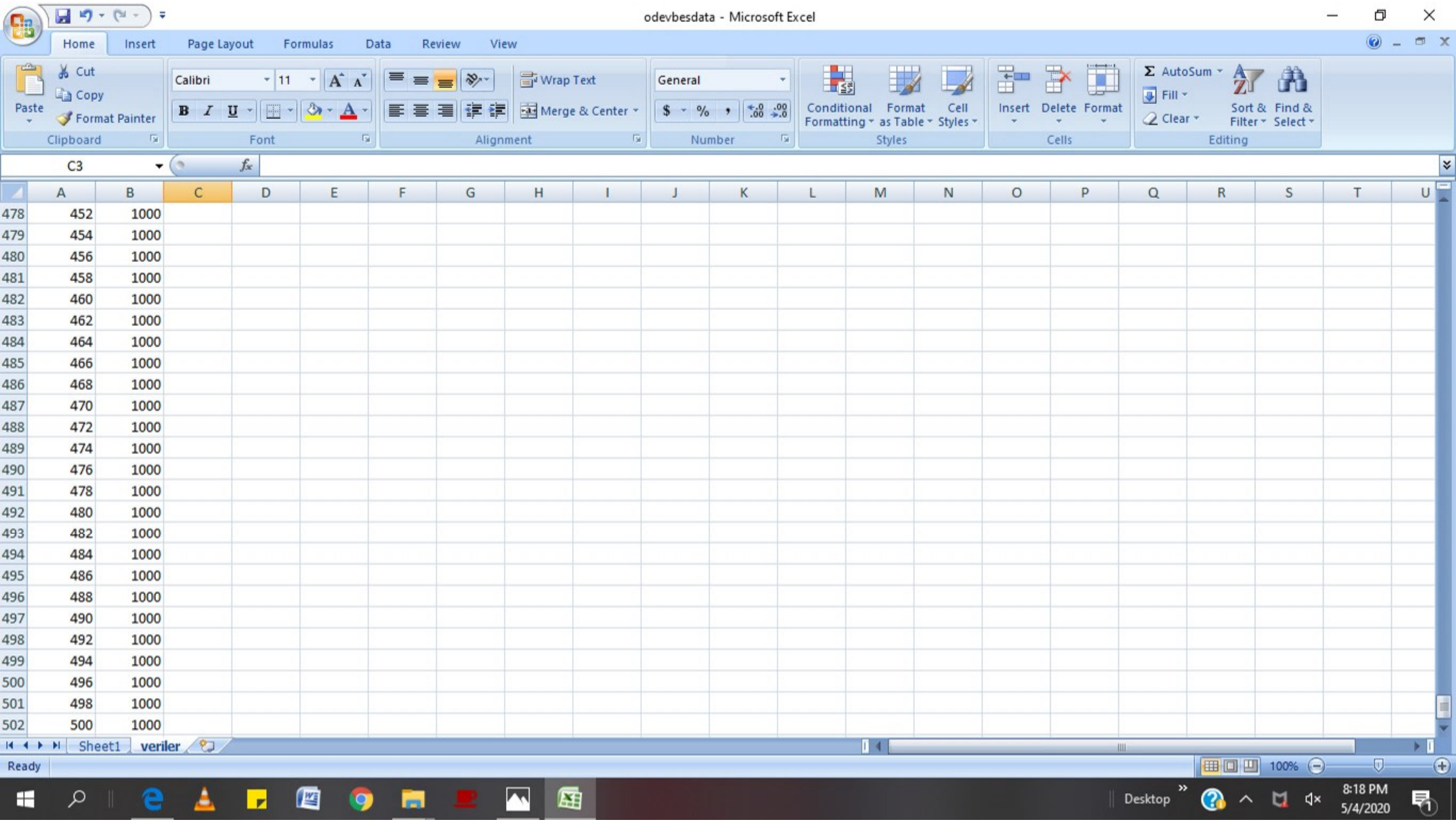
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