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16/ENG04/023
Elect / Elect
ENG 232

Assignment

1(a) For bacterial growth we use

$$dy/dt = ky$$

$$dy/y = k\,dt$$

$$\int dy/y = \int k\,dt$$

$$\ln y = kt + c$$

$$y = e^{kt+c}$$

$$y = e^{kt} \cdot e^{c}$$

$$y = e^{kt} \cdot C$$

$$y = Ce^{kt}$$

At initial time $t = 0$hr, $y = 20$

$$20 = Ce^{k \cdot 0}$$

$$C = 20$$

At $t = 5$, $y = 2y_0$

$t = 5$ $y = 40$

$$40 = Ce^{k \cdot 5}$$

$$40 = 20 \cdot e^{5k}$$

$$e^{5k} = 2$$

$$5k = \ln 2$$

$$5k = 0.6931$$

$$k = 0.1388$$

$y = 20e^{0.1386t}$ is the required model

1b) At $t = 1\frac{1}{2}$ day

$t = (24 + 12)$ hours

$t = 36$ hours

$y = 20e^{36 \times 0.1386}$

$y = 20 \times 146.8777$

$y = 2937.55$

1d) At $y = 10$ and $t = 0$

$10 = Ce^{k0}$

$C = 10$

At $t = 5$, $y = 20$

$20 = 10e^{5k}$

$e^{5k} = 2$

$5k = \ln 2$

$k = 0.1386$

for initial value = 10, we have $y = 10e^{0.1386t}$

" = 30, " $y = y = 30e^{0.1386t}$

" = 50 " $y = 50e^{0.1386t}$

1e) The initial amount of bacteria affected the experimental growth of the bacteria the highest initial amount had the highest final amount

Book1 - Excel

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Cut Copy Format Painter — Paste — Clipboard

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General — Number

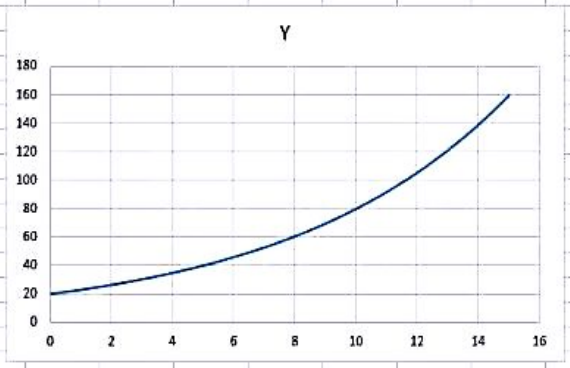
Conditional Formatting Format as Table Cell Styles — Styles

Insert Delete Format — Cells

AutoSum Fill Clear Sort & Filter Find & Select — Editing

S4

	A	B
1	t	Y
2	0	20
3	0.25	20.70515
4	0.5	21.43515
5	0.75	22.1909
6	1	22.97329
7	1.25	23.78327
8	1.5	24.6218
9	1.75	25.4899
10	2	26.3886
11	2.25	27.319
12	2.5	28.28219
13	2.75	29.27934
14	3	30.31165
15	3.25	31.38036
16	3.5	32.48675
17	3.75	33.63214
18	4	34.81792
19	4.25	36.04551
20	4.5	37.31638
21	4.75	38.63205
22	5	39.99411
23	5.25	41.4042
24	5.5	42.864
25	5.75	44.37527



Sheet1

READY

100%

Book1 - Excel

CHART TOOLS

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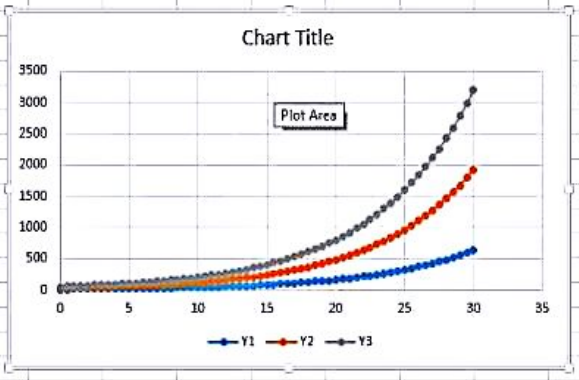
Add Chart Element | Quick Layout | Change Colors | Chart Styles | Switch Row/ Column | Select Data | Change Chart Type | Move Chart

Chart Layouts | Chart Styles | Data | Type | Location

Chart 3

	A	B	C	D
1	t	Y1	Y2	Y3
2	0	10	30	50
3	0.5	10.71758	32.15273	53.58788
4	1	11.48665	34.45994	57.43323
5	1.5	12.3109	36.9327	61.5545
6	2	13.1943	39.58291	65.97151
7	2.5	14.14109	42.42328	70.70547
8	3	15.15583	45.46748	75.77914
9	3.5	16.24337	48.73012	81.21687
10	4	17.40896	52.22688	87.04481
11	4.5	18.65819	55.97456	93.29094
12	5	19.99706	59.99117	99.98528
13	5.5	21.432	64.296	107.16
14	6	22.96991	68.90973	114.8495
15	6.5	24.61818	73.85453	123.0909
16	7	26.38472	79.15416	131.9236
17	7.5	28.27803	84.83408	141.3901
18	8	30.30719	90.92158	151.536
19	8.5	32.48197	97.4459	162.4098
20	9	34.8128	104.4384	174.064
21	9.5	37.31088	111.9327	186.5544
22	10	39.98823	119.9647	199.9411
23	10.5	42.85769	128.5731	214.2885
24	11	45.93306	137.7992	229.6653
25	11.5	49.22911	147.6873	246.1455



Sheet1 Sheet2

READY AVERAGE: 350.8810869 COUNT: 248 SUM: 85614.98519 100%