

Log & Exponential Equations

1.) Solver

2.) Intersection Method.

3.) by Hand

Ex

$$3^{x+1} = 12^{2x-3}$$

2) $y_1 = 3^{x+1}$

$y_2 = 12^{2x-3}$

calc \bar{s} : Intersection
(enter)

$x = 2.2$

1) Solver

$$0 = 3^{x+1} - 12^{2x-3}$$

3) $3^{x+1} = 12^{2x-3}$

(P5) "log of both sides"

$$\log 3^{x+1} = \log 12^{2x-3}$$

(P3) "ladder"

$$(x+1) \log 3 = (2x-3) \log 12$$

(Algebra)

$$x \log 3 + \log 3 = 2x \log 12 - 3 \log 12$$

$$x \log 3 - 2x \log 12 = -\log 3 - 3 \log 12$$

$$x (\log 3 - 2 \log 12) = -\log 3 - 3 \log 12$$

$$x = \frac{-\log 3 - 3 \log 12}{\log 3 - 2 \log 12} = 2.2$$

P3

$$= \frac{\log 3^{-1} + \log 12^{-3}}{\log 3 - \log 12^2}$$

P2

$$= \frac{\log (3^{-1} \cdot 12^{-3})}{\log (3 \cdot 12^{-12})}$$

P4

$$= \log_{\left(\frac{3}{12^2}\right)} (3^{-1} \cdot 12^{-3})$$

Exponential Regression

$$Y = a \cdot b^x$$

$$P = Q \cdot e^{RT}$$

$$Y = \text{END} = P$$

$$a = \text{START} = Q$$

$$x = \text{TIME} = T$$

$$(b)^x = (e^{RT})$$

$$b = e^R$$

$$R = \log_e(b)$$

$$R = \ln(b)$$

$$R = -0.254\dots$$

25.42%

Drop?

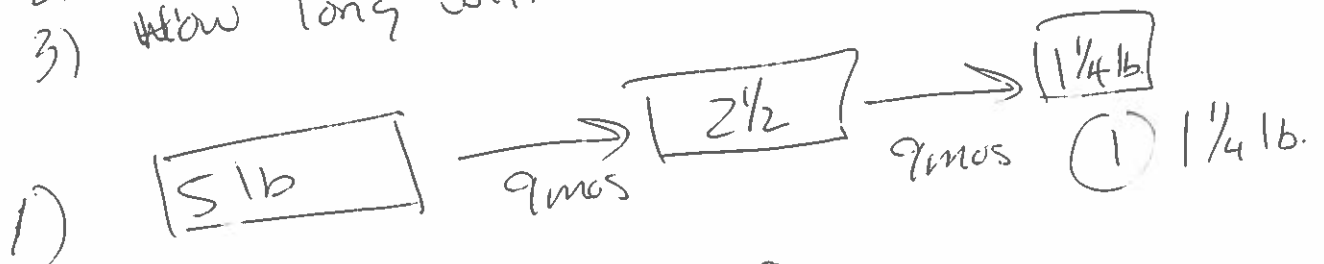
Lady G Drop 25% a year 😊

Compound Continuously ($N = \infty$)

$$P = Q e^{RT}$$

If Velveteer has a half-life
of 9 months,

- 1) How much is 5 lb block after 18 months?
- 2) What is its rate of decay?
- 3) How long will it take to reach 1 lb?



2) $\frac{2\frac{1}{2}}{5} = \frac{5 \text{ lbs}}{5} e^{R \cdot 9 \text{ mos}}$

$$\frac{1}{2} = e^{R \cdot 9}$$

(PI)

$$9R = \log_e\left(\frac{1}{2}\right)$$

$$R = \frac{\ln(1/2)}{9} = -0.077 \dots \dots 20.89 \dots \text{ MONTH}$$

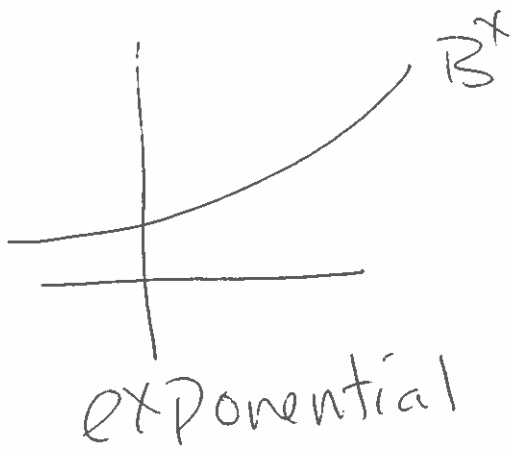
7.7% decay
per month

$$P = 1$$

$$Q = 5$$

$$R = -0.077 \dots$$

$$T = ?$$



exponential

Compound Interest Formula

$$P = Q \left(1 + \frac{R}{N}\right)^{NT}$$

P - Final Amount

Q - Initial Amount

R - Interest Rate

T - Time

N = # of compounds per period

N = 1 once a year

N = 2 semi-annual

N = 4 quarterly

N = 12 monthly

N = 52 weekly

N = 365 Daily

EX

\$1000 Bond

\$500 Cost

30 years to mature

What's the interest rate?

$$N = 12$$

$$P = Q \left(1 + \frac{R}{N}\right)^{NT}$$


$$\frac{1000}{500} = \frac{500}{500} \left(1 + \frac{R}{12}\right)^{12 \cdot 30}$$

$$2 = \left(1 + \frac{R}{12}\right)^{360}$$

$$\sqrt[360]{2} = 1 + \frac{R}{12}$$

$$\sqrt[360]{2} - 1 = R/12$$

$$12(\sqrt[360]{2} - 1) = R$$

| | |
|---|--|
| GROUP NAME: <u>J / P</u> Logo:  | Student Names (First and Last) Speaker/Presenter: <u>Jake Imbelle</u> |
| Date: <u>12/9/2015</u> Topics: | Writer/Prep: <u>Kevin Williams</u> QC/Leader: <u>Kevin Williams</u> |

Instructions:

$x = 1000$
 $y = 10000$
 $z = 100000$

Approximation of e^x using Taylor series expansion

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$

Example 1: $x = 1$

$$e^1 = 1 + 1 + \frac{1^2}{2} + \frac{1^3}{6} + \frac{1^4}{24} + \dots$$

Example 2: $x = 10$

$$e^{10} = 1 + 10 + \frac{10^2}{2} + \frac{10^3}{6} + \frac{10^4}{24} + \dots$$

Example 3: $x = 100$

$$e^{100} = 1 + 100 + \frac{100^2}{2} + \frac{100^3}{6} + \frac{100^4}{24} + \dots$$

Example 4: $x = 1000$

$$e^{1000} = 1 + 1000 + \frac{1000^2}{2} + \frac{1000^3}{6} + \frac{1000^4}{24} + \dots$$

Example 5: $x = 10000$

$$e^{10000} = 1 + 10000 + \frac{10000^2}{2} + \frac{10000^3}{6} + \frac{10000^4}{24} + \dots$$

Example 6: $x = 100000$

$$e^{100000} = 1 + 100000 + \frac{100000^2}{2} + \frac{100000^3}{6} + \frac{100000^4}{24} + \dots$$

Example 7: $x = 1000000$

$$e^{1000000} = 1 + 1000000 + \frac{1000000^2}{2} + \frac{1000000^3}{6} + \frac{1000000^4}{24} + \dots$$

Example 8: $x = 10000000$

$$e^{10000000} = 1 + 10000000 + \frac{10000000^2}{2} + \frac{10000000^3}{6} + \frac{10000000^4}{24} + \dots$$

Example 9: $x = 100000000$

$$e^{100000000} = 1 + 100000000 + \frac{100000000^2}{2} + \frac{100000000^3}{6} + \frac{100000000^4}{24} + \dots$$

Example 10: $x = 1000000000$

$$e^{1000000000} = 1 + 1000000000 + \frac{1000000000^2}{2} + \frac{1000000000^3}{6} + \frac{1000000000^4}{24} + \dots$$

Example 11: $x = 10000000000$

$$e^{10000000000} = 1 + 10000000000 + \frac{10000000000^2}{2} + \frac{10000000000^3}{6} + \frac{10000000000^4}{24} + \dots$$

Example 12: $x = 100000000000$

$$e^{100000000000} = 1 + 100000000000 + \frac{100000000000^2}{2} + \frac{100000000000^3}{6} + \frac{100000000000^4}{24} + \dots$$

Example 13: $x = 1000000000000$

$$e^{1000000000000} = 1 + 1000000000000 + \frac{1000000000000^2}{2} + \frac{1000000000000^3}{6} + \frac{1000000000000^4}{24} + \dots$$

Example 14: $x = 10000000000000$

$$e^{10000000000000} = 1 + 10000000000000 + \frac{10000000000000^2}{2} + \frac{10000000000000^3}{6} + \frac{10000000000000^4}{24} + \dots$$

Example 15: $x = 100000000000000$

$$e^{100000000000000} = 1 + 100000000000000 + \frac{100000000000000^2}{2} + \frac{100000000000000^3}{6} + \frac{100000000000000^4}{24} + \dots$$

Example 16: $x = 1000000000000000$

$$e^{1000000000000000} = 1 + 1000000000000000 + \frac{1000000000000000^2}{2} + \frac{1000000000000000^3}{6} + \frac{1000000000000000^4}{24} + \dots$$

Example 17: $x = 10000000000000000$

$$e^{10000000000000000} = 1 + 10000000000000000 + \frac{10000000000000000^2}{2} + \frac{10000000000000000^3}{6} + \frac{10000000000000000^4}{24} + \dots$$

Example 18: $x = 100000000000000000$

$$e^{100000000000000000} = 1 + 100000000000000000 + \frac{100000000000000000^2}{2} + \frac{100000000000000000^3}{6} + \frac{100000000000000000^4}{24} + \dots$$

Example 19: $x = 1000000000000000000$

$$e^{1000000000000000000} = 1 + 1000000000000000000 + \frac{1000000000000000000^2}{2} + \frac{1000000000000000000^3}{6} + \frac{1000000000000000000^4}{24} + \dots$$

Example 20: $x = 10000000000000000000$

$$e^{10000000000000000000} = 1 + 10000000000000000000 + \frac{10000000000000000000^2}{2} + \frac{10000000000000000000^3}{6} + \frac{10000000000000000000^4}{24} + \dots$$

Example 21: $x = 100000000000000000000$

$$e^{100000000000000000000} = 1 + 100000000000000000000 + \frac{100000000000000000000^2}{2} + \frac{100000000000000000000^3}{6} + \frac{100000000000000000000^4}{24} + \dots$$

Example 22: $x = 1000000000000000000000$

$$e^{1000000000000000000000} = 1 + 1000000000000000000000 + \frac{1000000000000000000000^2}{2} + \frac{1000000000000000000000^3}{6} + \frac{1000000000000000000000^4}{24} + \dots$$

Example 23: $x = 10000000000000000000000$

$$e^{10000000000000000000000} = 1 + 10000000000000000000000 + \frac{10000000000000000000000^2}{2} + \frac{10000000000000000000000^3}{6} + \frac{10000000000000000000000^4}{24} + \dots$$

Example 24: $x = 100000000000000000000000$

$$e^{100000000000000000000000} = 1 + 100000000000000000000000 + \frac{100000000000000000000000^2}{2} + \frac{100000000000000000000000^3}{6} + \frac{100000000000000000000000^4}{24} + \dots$$

Example 25: $x = 1000000000000000000000000$

$$e^{1000000000000000000000000} = 1 + 1000000000000000000000000 + \frac{1000000000000000000000000^2}{2} + \frac{1000000000000000000000000^3}{6} + \frac{1000000000000000000000000^4}{24} + \dots$$

Example 26: $x = 10000000000000000000000000$

$$e^{10000000000000000000000000} = 1 + 10000000000000000000000000 + \frac{10000000000000000000000000^2}{2} + \frac{10000000000000000000000000^3}{6} + \frac{10000000000000000000000000^4}{24} + \dots$$

Example 27: $x = 100000000000000000000000000$

$$e^{100000000000000000000000000} = 1 + 100000000000000000000000000 + \frac{100000000000000000000000000^2}{2} + \frac{100000000000000000000000000^3}{6} + \frac{100000000000000000000000000^4}{24} + \dots$$

Example 28: $x = 1000000000000000000000000000$

$$e^{1000000000000000000000000000} = 1 + 1000000000000000000000000000 + \frac{1000000000000000000000000000^2}{2} + \frac{1000000000000000000000000000^3}{6} + \frac{1000000000000000000000000000^4}{24} + \dots$$

Example 29: $x = 10000000000000000000000000000$

$$e^{10000000000000000000000000000} = 1 + 10000000000000000000000000000 + \frac{10000000000000000000000000000^2}{2} + \frac{10000000000000000000000000000^3}{6} + \frac{10000000000000000000000000000^4}{24} + \dots$$

Example 30: $x = 100000000000000000000000000000$

$$e^{100000000000000000000000000000} = 1 + 100000000000000000000000000000 + \frac{100000000000000000000000000000^2}{2} + \frac{100000000000000000000000000000^3}{6} + \frac{100000000000000000000000000000^4}{24} + \dots$$

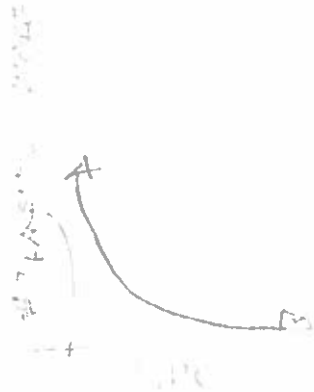
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|--|---|
| GROUP NAME: <u>TID</u> Logo: | Student Names (First and Last) Speaker/Presenter: <u>Dominique</u> |
| Date: <u>10/09/13</u> Topics: <u>SALE OF ILLINOIS</u> | Writer/Prep: _____ QC/Leader: <u>TID</u> |

Instructions:

[Faint handwritten notes and a diagram are visible in this section. The diagram appears to be a circle with a radius line drawn from the center to the circumference. There are also some illegible scribbles and numbers scattered throughout the area.]

| | |
|---|--|
| <p>GROUP NAME: <u>LA LINDA</u></p> <p>Logo:</p> | <p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>JIM KUKER</u></p> |
| <p>Date: <u>10-9-13</u> # OF TIME VS</p> <p>Topics: <u>EXPONENTIAL DECREASE</u></p> | <p>Writer/Prep: <u>JOE</u></p> <p>QC/Leader: <u>VINCE</u></p> |

Instructions:



$$P - Qe^{(RT)} = 0$$

$$t = 43.139$$

$$Q = 158.29$$

$$R = -0.026$$

$$T = 50$$

| TIME | # OF... |
|------|---------|
| 10 | 100 |
| 20 | 77 |
| 30 | 58 |
| 40 | 43 |
| 50 | 32 |
| 60 | 24 |

DECAY by 2.6% PER YEAR

| | |
|---|---|
| <p>GROUP NAME: <u>Love Math</u></p> <p>Logo: <u>(+ - x ÷)</u></p> | <p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>Lucy Guo</u></p> |
| <p>Date: _____</p> <p>Topics: <u>China's population</u></p> | <p>Writer/Prep: <u>Scott</u></p> <p>QC/Leader: <u>Rex</u></p> |

Instructions:

$$y = a \cdot b^x$$

$$a = 1.265$$

$$b = 1.05$$

China's population has grown 5% from 2000 to 2012 due to the birth of my auto.

| y | x |
|------|-----------------|
| 2000 | 1.263 (billion) |
| 2003 | 1.288 (billion) |
| 2006 | 1.311 |
| 2009 | 1.331 |
| 2012 | 1.351 |

| | |
|-----------------------------------|---|
| GROUP NAME: | Student Names (First and Last) |
| Logo: <u>BC</u> | Speaker/Presenter: <u>Stevie Kayden</u> |
| Date: <u>10/19</u> | Writer/Prep: <u>Jal Sinclair</u> |
| Topics: <u>(PI) Rate of Decay</u> | QC/Leader: <u>Danyan Zhou</u> |

Instructions:

| x | y |
|----|----|
| 2 | 16 |
| 4 | 15 |
| 6 | 13 |
| 8 | 8 |
| 10 | 6 |

$$\ln(.878) = -.1301086873$$

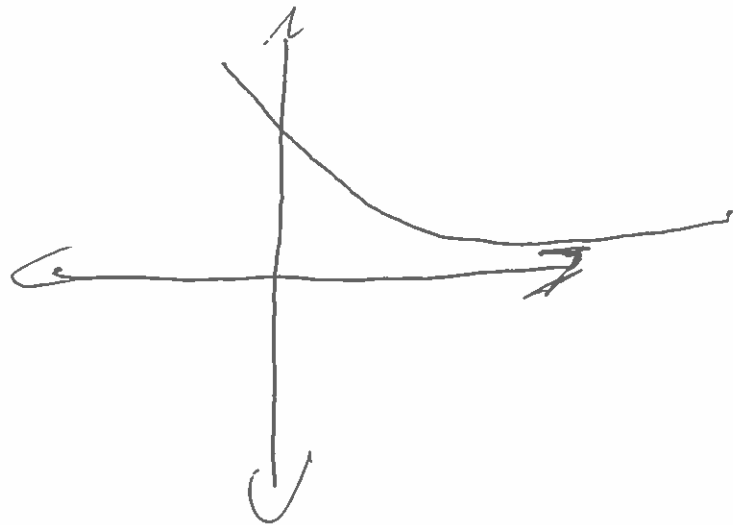
Glasses sales are going down 13% because of lasik.

MATH - CALC - OPT 10 (EXPREG)

$$y = a * b^x$$

$$a = 23.58 \dots$$

$$b = .878 \dots$$



MATH - OPT 10 - Solver

Equation Solver

$$eqn = 0 = P \cdot Qe^{r(T)}$$

Enter

P =

Q =

R =

T =

| | |
|--|---|
| <p>GROUP NAME: I ♥ Meth</p> <p>Logo:</p> | <p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>Shanon</u></p> |
| <p>Date: _____</p> <p>Topics:</p> | <p>Writer/Prep: <u>Avik Khacaja</u></p> <p>QC/Leader: <u>Onur Turkan</u></p> |

Instructions: RAM VS Buffer time

| L_1 | L_2 |
|-------|-------|
| 60 | 1 |
| 30 | 3 |
| 15 | 5 |
| 5 | 10 |

$Y = a + b^{1/x}$

$a = 10.54 \dots$

$b = .99 \dots$

$P = 10.54 e^{\dots}$

$\dots .04 \dots$

$\hookrightarrow -4\%$

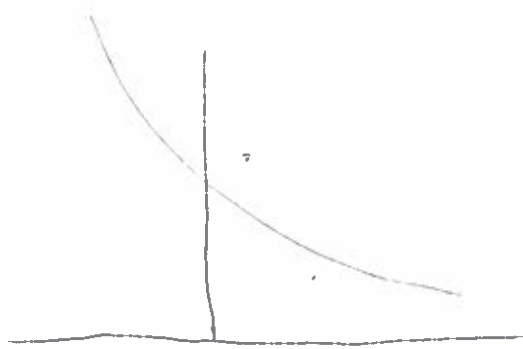
$y = P$

$a = 2 \rightarrow 10.54$


$X = T$

$R = \log(b)$

$\dots .04$

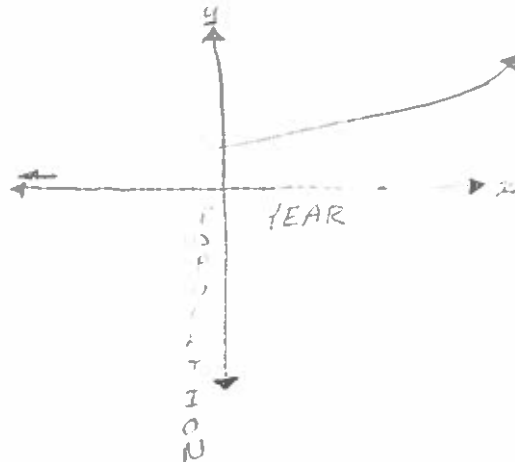


For every ram you get you lose about 4% of buffer time

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|---|---|
| <p>GROUP NAME: </p> <p>Logo:</p> | <p>Student Names (First and Last)</p> <p>Speaker/Presenter: _____</p> |
| <p>Date: _____</p> <p>Topics: <u>INTEGRAL REVENUE MAXIMIZER</u></p> | <p>Writer/Prep: <u>LAUREN VOLLS</u></p> <p>QC/Leader: <u>KENTON JONES</u></p> |

Instructions:

| YEAR | POPULATION |
|------|------------|
| 1 | 3.0 |
| 10 | 3.4 |
| 20 | 4.5 |
| 30 | - |
| 40 | 1.0 |



$$y = a \cdot b^x \quad P = Qe^{rt}$$

$$r = 2.322\% \quad P = 4.5$$

$$b = 1.022\% \quad Q = 2.82$$

$$r = 0.1219\% \quad T = 20$$

THERE IS AN EXPONENTIAL GROWTH IN THE POPULATION BY 2.19%

| | |
|--|--|
| <p>GROUP NAME:</p> <p>Logo: <i>The Darshil Group</i></p> | <p>Student Names (First and Last)</p> <p>Speaker/Presenter: <u>Pranav, Darshil</u></p> |
| <p>Date: _____</p> <p>Topics:</p> | <p>Writer/Prep: <u>Pranav</u></p> <p>QC/Leader: <u>Pranav</u></p> |

Instructions:

Given

20 *YFC*

3 *YFC*

year

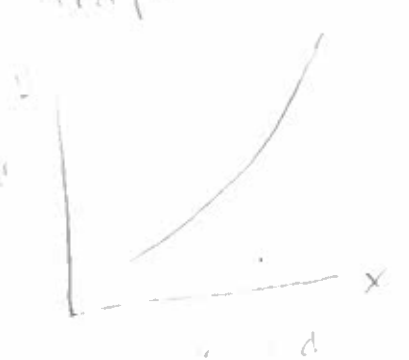
EX: 100000 (10%)

\rightarrow

P: Qe^{kt}

$\rightarrow Qe^{kt}$

Graph



Vars S, >>, (b)

$\ln(b) = \dots$

\rightarrow

be result =