Exponential Regression on the TI-92/Voyage 200 from the HOME Screen.

 References: Essential Mathematical Methods, Units 1 & 2: Chapter 13. Exponential Functions and Logarithms
 Essential Mathematical Methods 3 & 4: Chapter 5. Exponential and Logarithmic Functions Chapter 3 Variation; Section 3.3 Fitting Data.

Technology functions:

Basic Screens of calculator; ExpReg; ShowStat; Regeq(x); NewPlot

Introduction

Exponential regression on the TI 92+/Voyage 200 uses the formula $y = a \times b^x$, where the parameters are 'a' and 'b'. The above courses generally require the base, 'b', to be the number 10 or *e*. This can be achieved by a simple formula change, outlined below.

• Exponential regression is given as $y = a \times b^x$.

To change the base from 'b' to 'e'

$$y = a \times b^{x}$$

$$\frac{y}{a} = b^{x}$$

$$\log_{b}\left(\frac{y}{a}\right) = x$$
change base
$$x = \frac{\log_{e}\left(\frac{y}{a}\right)}{\log_{e} b}$$

$$(x \times \log_{e} b) = \log_{e}\left(\frac{y}{a}\right)$$

$$\frac{y}{a} = e^{(\log_{e} b \times x)}$$

$$y = a \times e^{(\log_{e} b \times x)}$$

$$y = a \times b^{x}$$

$$y = a \times e^{\log_{e} b \times x}$$

Note: For base '10', substitute '10' for 'e'.

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Example of Exponential Regression on the TI 92+/Voyage 200

Find the exponential regression equation for the following data.

x	1	2	3	4
У	2	4	6.5	10

Home screen

'State-up' view on Voyage 200 only.

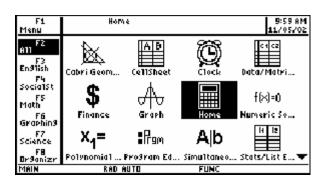
Highlight Home; press ENTER

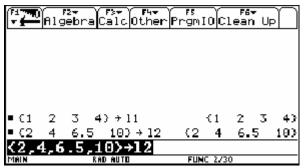
Note: TI 92+ boots up on the Home screen

Enter the data into list 1 (L1) and list 2 (L2)

2nd (1, 2, 3, 4 2nd) STO► 1,1 ENTER

2nd (2, 4, 6.5, 10 2nd) STO► 1,2 ENTER





• [WINDOW]

Set window as shown

xmin=0. xmax=5.		
xscl=1. ymin=0. ymax=12.		
yscl=2. xres=1		
MAIN	RAD AUTO	FUNC

(*** **	Zoom	
X	TABLE SETUP	
	tblStart <mark>0.</mark> ≤tbl <u>1.</u> Graph <-> Table OFF→ Independent AUTO→ (<u>Enter=SAVE</u>)	(ESC=CANCEL)
TYPE	+ CENTERI-OK AND LESCI-CANCEL	

Set TBLSET as shown

Press ENTER ENTER

Return to **Home screen**

ExpReg space 11,12 ENTER

Note: This calculates the regression equation

(^{F1} ₩ Algebra Calc Other	rPrgmIOClean Up
■{1 2 3 4}→11	{1 2 3 4}
■(2 4 6.5 10) → 12	(2 4 6.5 10)
■ ExpReg 11,12	Done
expreg 11,12	
MAIN RAD AUTO	FUNC 3730

Show Stat ENTER

Note: This displays the values of a *and* b.

The regression equation is:

 $y = 1.264911 \times 1.701282^{x}$

Press ENTER to return to Home screen

Regeq(x) **STO** y1(x) **ENTER**

Note: Stores regression equation into y1

[⁷⁴ ▼₩] ▼₩ 619	F2+ F3+ F5+ F5 F1+ STAT VARS	yn Up
	y=a·b^x a =1.264911 b =1.701282	
• (1 2		3 43
■{2 4		.5 10)
ExpReg	(Enter=OK)	<u>) Done</u>
showst	at	-
MAIN	RADIAUTO FUNC 3/30	

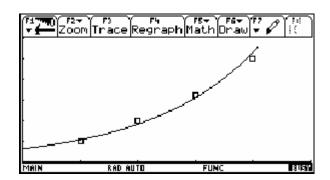
	2+ ebra <mark>Calc</mark> Other	PrgmI0C1	ean Up
• (1 2	3 4) → 11	₹1	2 3 43
■{2 4	6.5 10)→12	(24)	6.5 10)
ExpReg	11,12		Done
 ShowSta 	t		Done
■ regeq(x))≯y 1 (x)		Done
	x)→y1(x)		
MAIN	RAD AUTO	FUNC 5730)

(F1740)	F.	2-	Y F3∓ '	(F4+ '	(_ F5	1	í	- F6-	·	ĩΊ
⊤ f—	A lg(ebra	Calc	Other	Prgm	10	C1	ean	Up	인 [
- (1	2	3	4) + 1	1		1		2	3	4)
• {2	4	6.5	100	+ + 12	{2		4	6.5	5	103
■ ЕхрЯ	leg (11,	12						Ľ)one
Show	/Sta	t.)one
■ rege	eq(x))≯y	1(×)						C)one
■ NewF	lot	1,	1,11,	, 12)one
newp	lo			1,12						
MAIN		F	AD AUTO		FUN	IC 6	i/30			

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NewPlot space 1, 1, 11,12 ENTER

Note: **NewPlot** sets up a scatter plot of original data. The first '1' specifies a scatter plot; the second '1' specifies each data point to be displayed as a 'box'. • [GRAPH] displays the *scatter plot* and *graph* of the regression equation



Changing base of regression equation

 $y = 1.264911 \times 1.701282^{x}$ $y = 1.264911 \times e^{\log_{e} 1.701282 \times x}$ $y = 1.264911 \times e^{0.531382x}$

Check that this regression equation with base 'e' is the same equation

◆ [Y=]

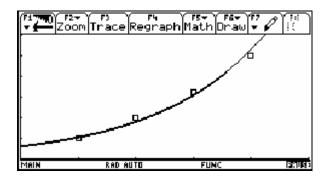
Enter equation into y2, as shown

[⁷¹ 770] F2→ F3 F4 F5→ F6→ 61 ▼
vyl=regeq(x)
yg2=1.264911
û4= [—] 95=
96= 97=
90- 99= u10=
MAIN RAD AUTO FUNC

Draw as a **thick** line to highlight graph of y2

F6 4 ENTER

F17770) F2▼) F3) F4) F5▼ ▼	Style Steel
JPLOTS 1	√1:Line
√yi= <u>regeq(x</u>)	2:Dot
√y2= 1.264911 • € • 53138	<u>3:Square</u>
u3=	
u4=	5 Animate
ūŚ=	<u>6</u> Path
<u>46</u> =	7:Above
ÿ7=	8:Belou
<u>9</u> 8=	
99 <u>=</u>	
<u>10=</u>	
<u>y2(x)=1.264911*</u>	e^(.531382★x)
MAIN RAD AUTO	FUNC



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×	y 1	<u>y</u> 2			
0.	1.2649	1.2649			
1.	2.152	2.152			
2.	3.6611	3.6611			
3.	6.2286	6.2286			
4.	10.597	10.597			
5.	18.028	18.028			
6.	30.67	30.67			
7.	52.179	52.179			
x=0.					·
MAIN	RA	D AUTO	FL	JNC	