Precalc 11.7

Find doubling time of exponential relationships
Model data using exponential and logarithmic relationships

nonlinear regression

Quiz 11.5-11.6

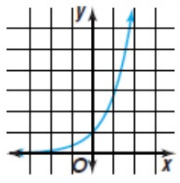
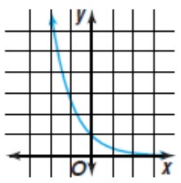
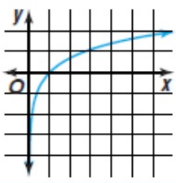
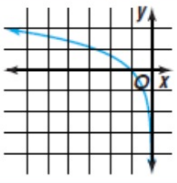
exponential

logarithmic

"in terms of e"

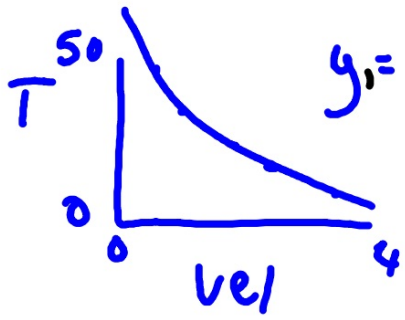
"linearize the data"

correlation coefficient (r)

Exponential Functions: $y = ab^x$		Logarithmic Functions: $y = a + b \ln x$	
Growth	Decay	Growth	Decay
			

3 SKATING An ice skater begins to coast with an initial velocity of 4 meters per second. The table below gives the times required for the skater to slow down to various velocities. Find an equation that models the data.

	L1						
	velocity (m/s)	3.5	3	2.5	2	1.5	1	0.5
L2	time (s)	2.40	5.18	8.46	12.48	17.66	24.95	37.43



$y_1 = 65.086(0.4207)^x$

$r = 0.99$

$0.4207 = e^n$

$n = -0.8658$

$y = 63.086(e^{-0.8658})^x$

$y_2 = 63.086e^{-0.8658x}$

$200 = 100e^{rt}$

$2 = e^{rt}$

$A = Pe^{rt}$

50 100

$0.5 = e^{rt}$

Exponential:
"in terms of e" so that you can do half-life, doubling time, etc.

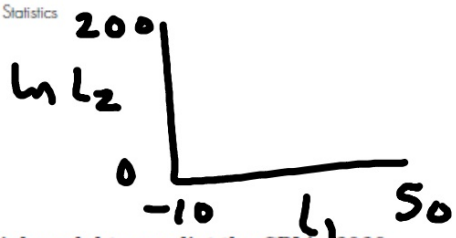
4 ECONOMICS The Consumer Price Index (CPI) measures inflation. It is based on the average prices of goods and services in the United States, with the average for the years 1982–1984 set at an index of 100. The table below gives some CPI values from 1950 to 1996.

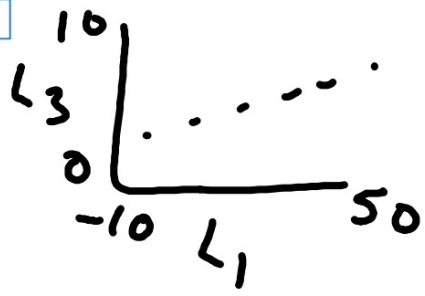
Year	1950	1960	1970	1980	1990	1996
CPI	24.1	29.6	38.8	82.4	130.7	156.9

Source: Bureau of Labor Statistics

0 10 20 30 40 46

LinReg L_1, L_3



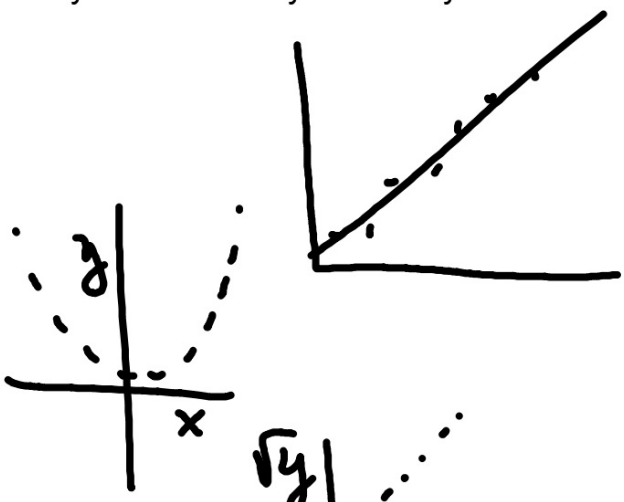


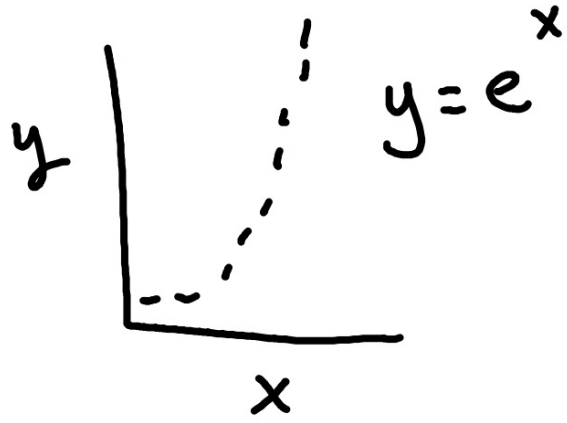
d. Use the exponential model to predict the CPI in 2020.

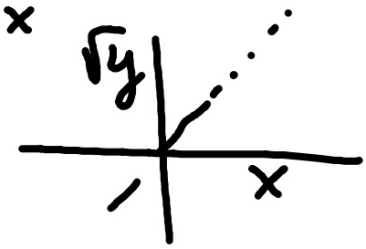
"in terms of e"

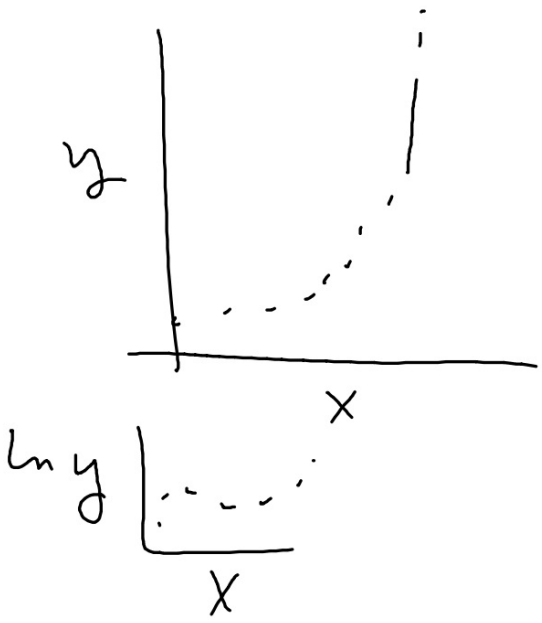
Write the equation in terms of e

To linearize data (old school):
If you think it is $y=x^2$ then $y=\sqrt{}$ will be linear
If you think it is $y=10^x$ then $y=\log x$ will be linear
If you think it is $y=e^x$ then $y=\ln x$ will be linear








y
X
ln y
X