form of log. function ⇒ $y = a\log_b x$ from 7.4

7.5 – Modelling Data Using Logarithmic Functions

Date: May 2

Logarithmic functions can be used to represent different relationships experienced in real life.

- A logarithmic function may be a good model for a set of data if a scatter plot of the data forms an increasing or decreasing curve in QI and/or QIV
- Most graphing calculators and spreadsheets provide the equation of the logarithmic regression function in the form

CALCULATOR WILL MODEL IN THIS FORM ⇒ $y = a + b \ln x$

natural log base = e ("b" in 7.4 notes)

coefficient "a" in 7.4 notes

constant (shifts curve)

BECAUSE LOG FUNCTIONS ARE THE INVERSE OF EXP. FUNCTIONS

* independent and dependent variables often seem "switched" when using log. function to model data

CLUES
1. wording
2. table
3. shape of scatter plot

Example: Use the data in the table to determine the equation of the logarithmic regression function for time, t, in years since 1996, as a function of the population, P. In which year will Nunavut's population exceed 40 000?

P → x (first column usually independent)

t → y (second column usually dependent)

Population of Nunavut	Years since 1996
33 330	15
32 194	13
31 272	11
30 328	9
29 320	7
28 134	5
26 820	3
25 884	1

t depending on P

t ↑ dependent; P ↑ independent

① enter data and create a scatter plot

② STAT Calc 9:LnReg ⇒ $t = -558.521 + 55.033 \cdot \ln P$

③ When P=40000 ⇒ graph reg. equation, find VALUE when x=40000, y=24.6

1996 + 24.6 = 2020.6.

Population will exceed 40 000 part way through 2020.

Example: Acetaminophen is used to treat mild pain and discomfort. A patient was given a dose of acetaminophen and had the quantity in the bloodstream tracked over time. The results are shown below. If the concentration of acetaminophen in the blood must be below 50 mg before the next dose can be applied, how long should the patient wait between doses?

x Acetaminophen in blood [mg]	y Time [hours]
168	1
113	5
90	6.5
83	7.0
51	12.0
33	14.0
23	18.1
18	20.0

$y = 44.054 - 8.342 \ln x$

$x = 50 \longrightarrow y = 11.4$

wait about 11.5 hours between doses.