Chapter 4

$y = 5e^x$ exponential fcn.

$y = 6(2^{-x})$ variable in exponent

$y = 5x^7$

$y = 4x^{1.3}$ Allometric Fcn

variable in base

Sept 9

Lenhart

① $\log_2(8) = 3$ $\qquad 2^{?} = 8$

② $\log_2\left(\frac{1}{16}\right) = -4$ $\qquad 2^{-4} = \frac{1}{16}$

③ $\ln(e^2) = 2$

④ $\log(10^5) = 5$

⑤

$$10^{\log 100}$$

$$= 10^{\log 10^2}$$

$$= 10^{2\log 10}$$

$$= 10^2$$

$$\log(a^b) = b\log a$$

6

$$2^{3x} - 1 = 4$$

$$2^{3x} = 5$$

$$\ln 2^{3x} = \ln 5$$

$$3x \ln 2 = \ln 5$$

$$x = \frac{\ln 5}{3\ln 2}$$

7. $\ln(2x+1) = 3$

$$e^{\ln(2x+1)} = e^3$$

$$2x+1 = e^3$$

$$2x = e^3 - 1$$

$$x = \frac{e^3-1}{2}$$

8 $\log_3(\log_2(5x)) = 4$

$$3^{\log_3(\log_2 5x)} = 3^4$$

$$\log_2(5x) = 81$$

$$2^{\log_2(5x)} = 2^{81}$$

$$5x = 2^{81}$$

$$x = \frac{2^{81}}{5}$$

Exponential Function

$y = \beta \alpha^x$ <u>x in exponent</u>

Allometric Function

$y = b x^a$ <u>x in base</u>

Transform "nonlinear" data
to obtain a linear relationship
in transformed variables

4.2

2nd part
Chapter
4

Project 1 due
HW Sept 15 4.5, 4.7, 4.10, 4.11

Sept 11, 11
Class 6

~~4-5~~ 4.9

Exponential Fcn.

$$y = \beta \alpha^x$$

$$\ln y = \ln \beta + \ln(\alpha^x)$$

$$\ln y = \underbrace{\ln \beta}_{\text{intercept}} + x \underbrace{\ln \alpha}_{\text{slope}}$$

line with data $(x, \ln y)$

semi-log graph

$$y = \beta \, 10^{x}$$

$$\log y = \log \beta + \log 10^{x}$$

$$\log y = \log \beta + x \log 10$$

$$\log y = \log \beta + x$$

slope 1

semi-log

data $(x_1, y_1), \ldots, (x_n, y_n)$

semilog $(x_1, \ln y_1), \ldots, (x_n, \ln y_n)$

$|\rho| \approx 1$ for semilog data

means original data is approximately exponential

9-4
4/13

$y = bx^a$ Allometric

$\log y = \log b + a \log x$

line with data

$(\log x, \log y)$

log - log growth

Allometric Fcn.

$$y = bx^a$$

$$\ln y = \ln b + \underline{\ln(x^a)}$$

$$\ln y = \underbrace{\ln b}_{\text{intercept}} + \underbrace{a}_{\text{slope}} \underline{\ln x}$$

line with data $(\ln x, \ln y)$

log-log graph

log-log $(\ln x_1, \ln y_1), \ldots, (\ln x_n, \ln y_n)$

$|\rho| \approx 1$ for log-log data
means original data curve is
approximately allometric

Recall

Allometric fcn. of x and y

$\longleftrightarrow$ log-log regression line

Exponential fcn. of x and y

$\longleftrightarrow$ semi-log regression line

class 7

4-7
4-18

Hw 4.8

$$\log y = mx + b$$

$$\log y = -2x + b$$

$$-4 = -2(3) + b$$

$$2 = b$$

$$\log y = -2x + 2$$

$$10^{\log y} = 10^{-2x}10^{2}$$

$$y = 10^{-2x}(100)$$

$$y = (100)(10^{-2x})$$