5.7 – Nonlinear Modeling*

Exponential	$f(x) = Ca^x$ (exact), $f(x) = ab^x$ (regression)
Logarithmic	$f(x) = a + b \ln x$
Logistic	$f(x) = \dfrac{c}{1 + ae^{-bx}}$ (expo-log hybrid)

I. Using Scatterplots (rather than r^2, R^2) as justification.

Examples.

	x	0	1	2	3	4	5
(5)	y	-	2.04	3.47	5.90	10.02	-
(7)	y	-	1.1	3.1	4.3	5.2	5.8
(9)	y	0.3	1.3	4.0	7.5	9.3	9.8

II. Applications. (13) (17) (27)

---

* Power Function: $f(x) = ax^b$, b is a constant (NOT COVERED)

17. **Telecommuting** In the past some workers used technology such as e-mail, computers, and multiple phone lines to work at home, rather than in the office. However, because of the need for teamwork and collaboration in the workplace, fewer employees telecommuted than expected. The table lists telecommuters T in millions during year x.

x	1997	1998	1999	2000	2001
T	9.2	9.6	10.0	10.4	10.6

x	2002	2003	2004	2005	2006
T	11.0	11.1	11.2	11.3	11.4

Source: USA Today.

Find a function f that models the data, where $x = 1$ corresponds to 1997, $x = 2$ to 1998, and so on.

13. **Instagram Revenue** The following table lists projected revenue R in $ millions for Instagram x years *after* 2015.

x	0	1	2	3	4	5
R	112	300	910	1807	2781	3862

Source: Merrill Lynch.

(a) Find a function $R(x)$ that models the data.

(b) Graph R and the data.

2ND TABLE (c) Predict the revenue in 2022, or 7 years after 2015.

27. Tree Growth The height H of a tree in feet after x years is listed in the table.

x (yr)	1	5	10	20	30	40
$H(x)$ (ft)	1.3	3	8	32	47	50

(a) Evaluate $H(5)$ and interpret the answer.

(b) Find a function that models the data.

(c) Graph H and the data.

(d) What is the tree's age when its height is 25 feet?

(e) Did your answer involve interpolation or extrapolation?

