

Project: Viewing Television The table shows the average amounts of time spent in the U.S. viewing television (per home, per day) from 1989 through 2008. (Source: *The Nielsen Company*)

Year	Time, y
1989	7 h 2 min
1990	6 h 55 min
1991	6 h 56 min
1992	7 h 5 min
1993	7 h 12 min
1994	7 h 16 min
1995	7 h 15 min
1996	7 h 15 min
1997	7 h 12 min
1998	7 h 15 min
1999	7 h 24 min
2000	7 h 31 min
2001	7 h 39 min
2002	7 h 42 min
2003	7 h 55 min
2004	8 h 1 min
2005	8 h 11 min
2006	8 h 14 min
2007	8 h 14 min
2008	8 h 18 min

- (a) Use a graphing utility to plot the data. Let t represent the year, with $t = 9$ corresponding to 1989, and let y represent the time in hours in decimal form.
(For instance, 7 h 2 min in decimal form is $7\text{ h} + \frac{2}{60}\text{ h} \approx 7.033\text{ h}$.)
- (b) Using the technique discussed in Exercises 69 and 70 in Section 9.3, you can set up the following system of equations for the data, where t represents the year, with $t = 9$ corresponding to 1989.

$$\begin{cases} 20c + 370b + 7510a = 150.53 \\ 370c + 7510b + 163,540a = 2835.53 \\ 7510c + 163,540b + 3,747,946a = 58,452.1 \end{cases}$$

Use the matrix capabilities of the graphing utility to find the inverse matrix to solve the system and find the least squares regression parabola $y = at^2 + bt + c$.

- (c) Use the graphing utility to graph the model from part (b) and the original data in the same viewing window. How well does the model fit the data? Explain your reasoning.
- (d) Use the *regression* feature of the graphing utility to find a quadratic model for the data. How does the model given by the graphing utility compare with the model you found in part (b)?
- (e) Use the result of part (b) or part (d) to determine the year in which the average amount of time spent viewing television will be 9 hours per day.
- (f) Use the result of part (b) or part (d) to estimate the average amount of time spent per day viewing television in 2009.
- (g) The actual average amount of time spent per day viewing television was 8 hours 21 minutes in 2009. How does this value compare with your estimate from part (f)?