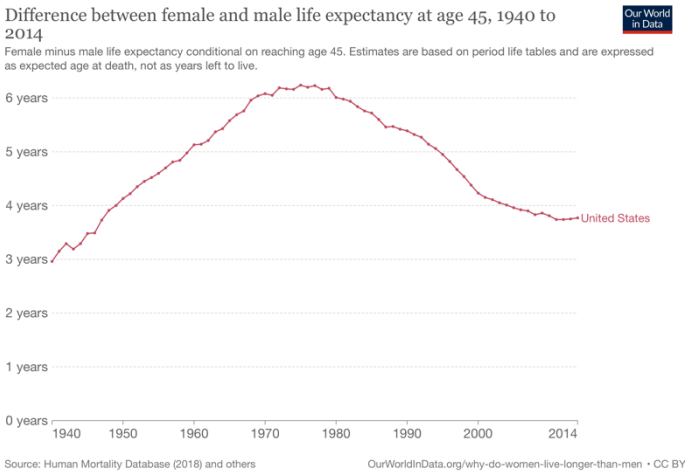
Do Females Live Longer than Males?

Yesterday you looked at a graph showing the average difference in life expectancy between females and males. Today you will also look at the specific data points used to make this graph. Let $D(t)$ represent the average difference in life expectancy, female − male, t years after 1940.

1. Why is a quadratic model a reasonable model for D when $0 \leq t \leq 60$?



2. Let $D(t) = at^2 + bt + c$ for some values of a, b, and c. What is the minimum number of data points you need to determine the values of a, b, and c? Why?

3. What is the value of c in your equation? How do you know?

4. Choose two other data points and write them as ordered pairs below.

5. Write and solve a system of equations that could be used to solve for a and b.

6. Do you think everyone in the class will have the same quadratic model? Why or why not?

7. Use your model to predict the average difference in life expectancy in 1983.

8. How close or far off was your model's prediction from reality?

9. Do you think your model will overestimate or underestimate the average difference in life expectancy in 2010? Explain.

10. Now let's consider another way we could have generated an equation for $D(t)$.
    a. In what year was there the largest difference in life expectancy between females and males? What was that difference?

    b. How is your answer to part a related to the graph?

    c. What vertical and horizontal shifts took place from the parent function, $y = x^2$, to produce the parabolic shape of D?

    d. Determine the vertical stretch or shrink that occurred from the parent function. Clearly show your method.

    e. Write an equation for $D(t)$ in vertex form.

11. Use this new model to predict the average difference in life expectancy in 1983. How close were you?

12. What benefits and drawbacks are there for either of your quadratic function models?

Lesson 3.5 – Constructing Function Models

QuickNotes

Check Your Understanding

1. Write the equation of a cubic function that has zeros at $x = -5, x = -1$ and $x = 2$ and a y-intercept at 30.

2. An organization sends out an annual Christmas newsletter in the mail. Last year, it took 7 volunteers 4 hours to stuff, address, and stamp all the envelopes. Assuming that the number of newsletters sent is the same and that each volunteer works at the same rate, write an equation for $T(v)$, the time it will take to complete this year's mailing if there are v volunteers.

3. Data for the world record for the men's 5000 m race is given in the table. Let $R(t)$ represent the world record time, in minutes, t years after 1972.
   a. Find the average change in the world record time per year since 1972.

   b. Write an expression for $R(t)$.

Year	Time for 5K
1972	13:16
1977	13:12
1978	13:08
1981	13:06
1982	13:00
1994	12:56
1995	12:44
1997	12:41
2004	12:37
2020	12:35