

Chapter

10

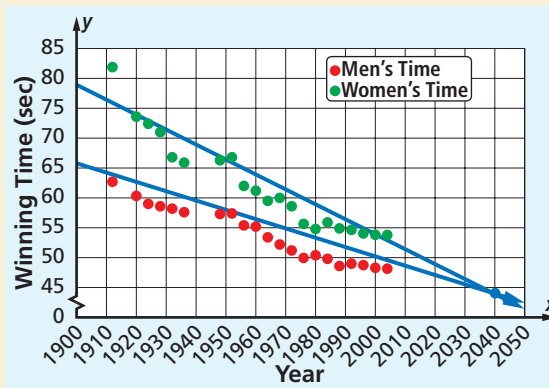
Linear Systems



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The table and graph below display the men's and women's winning times in the Olympic 100-meter freestyle swimming race for each Summer Olympic year from 1912 to 2004.

Year	Men's Time (sec)	Women's Time (sec)	Year	Men's Time (sec)	Women's Time (sec)
1912	63.4	82.2	1968	52.2	60.0
1920	60.4	73.6	1972	51.22	58.59
1924	59.0	72.4	1976	49.99	55.65
1928	58.6	71.0	1980	50.40	54.79
1932	58.2	66.8	1984	49.80	55.92
1936	57.6	65.9	1988	48.63	54.93
1948	57.3	66.3	1992	49.02	54.64
1952	57.4	66.8	1996	48.74	54.50
1956	55.4	62.0	2000	48.30	53.83
1960	55.2	61.2	2004	48.17	53.84
1964	53.4	59.5			



Source: *The World Almanac and Book of Facts*



The graph shows two trends. First, both men's and women's Olympic winning times have been decreasing rather steadily since 1912. Second, the women's winning time has been decreasing faster than the men's winning times. Regression lines have been fitted to the data. These lines have the following equations: $y = -0.1627x + 372.99$ (men) and $y = -0.269x + 589.83$ (women), where x is the year and y is the winning time in seconds. The lines intersect near (2040, 41).

This means that if the winning times were to continue to decrease at the rates they have been decreasing, the women's winning time will be about equal to the men's in the Olympic year 2040. The winning times will then each be about 41 seconds.

Finding points of intersection of lines or other curves by working with their equations is called *solving a system*. In this chapter you will learn various ways of solving systems.