

The population of Palm Springs was approximately 45,000 in 2003; 48,000 in 2008; and 44,000 in 2013 according to official estimates. We want to find a function for the population as a function of year. Measuring population in thousands of people and year as the number of years after 2000, we have three data points:

$$(3, 45), (8, 48), (13, 44)$$

Here we have the  $x$  values  $x = 3, 8,$  and  $13$ .

1. Find a polynomial function  $f(x)$  that fits these data points.

2. If we measured the years in five-year increments after 2003, our numbers would be easier to work with. 2008 is 1 five-year increment after 2003, and 2013 is 2 five-year increments after 2003. We'll call these new  $x$  values  $x'$ , with  $x' = 0, 1,$  and  $2$ . Find a different function,  $g(x')$ , that fits the data points

$$(0, 45), (1, 48), (2, 44)$$

3. How are these functions similar? How are they different?

4. Write  $x'$  as a function of  $x$ , and call it  $h(x)$ . Find  $g(h(x))$ . What is the result?

5. Write  $x$  as a function of  $x'$ , and call it  $j(x')$ . Find  $f(j(x'))$ . What is the result?

6. Graph the functions  $f(x)$ ,  $g(x')$ ,  $g(h(x))$  and  $f(j(x'))$ . How are these functions related?