

## Unit 5 Lesson 2: Moving Functions

### 1 What Happened to the Equation? (Warm up)

#### Student Task Statement

Graph each function using technology. Describe how to transform  $f(x) = x^2(x - 2)$  to get to the functions shown here in terms of both the graph and the equation.

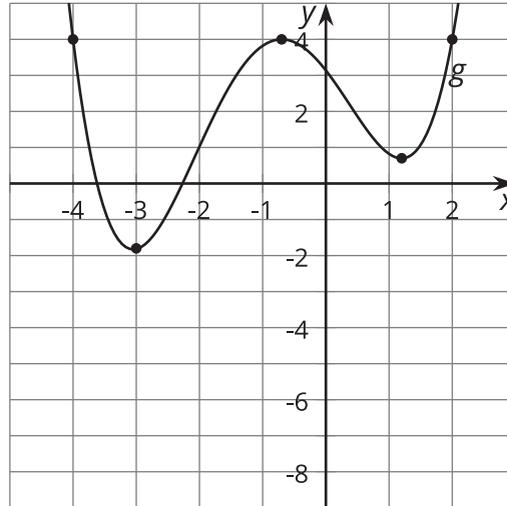
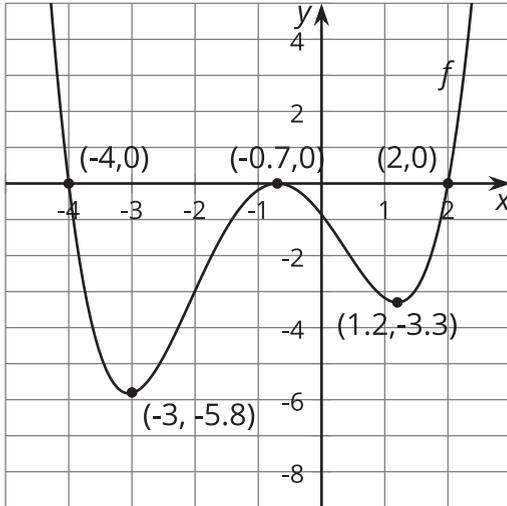
1.  $h(x) = x^2(x - 2) - 5$

2.  $g(x) = (x - 4)^2(x - 6)$

## 2 Writing Equations for Vertical Translations

### Student Task Statement

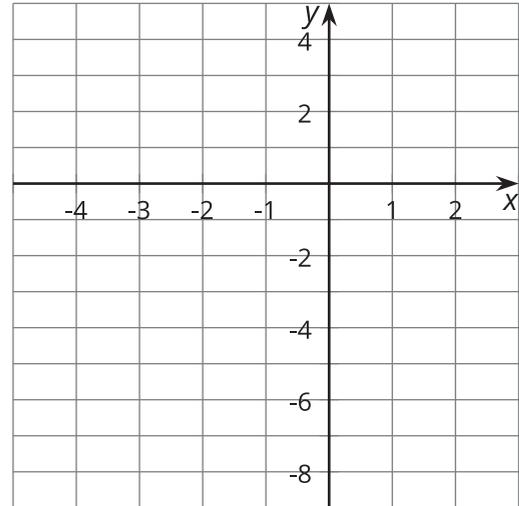
The graph of function  $g$  is a vertical translation of the graph of polynomial  $f$ .



1. Complete the  $g(x)$  column of the table.
2. If  $f(0) = -0.86$ , what is  $g(0)$ ? Explain how you know.
3. Write an equation for  $g(x)$  in terms of  $f(x)$  for any input  $x$ .
4. The function  $h$  can be written in terms of  $f$  as  $h(x) = f(x) - 2.5$ . Complete the  $h(x)$  column of the table.

$x$	$f(x)$	$g(x)$	$h(x) = f(x) - 2.5$
-4	0		
-3	-5.8		
-0.7	0		
1.2	-3.3		
2	0		

5. Sketch the graph of function  $h$ .



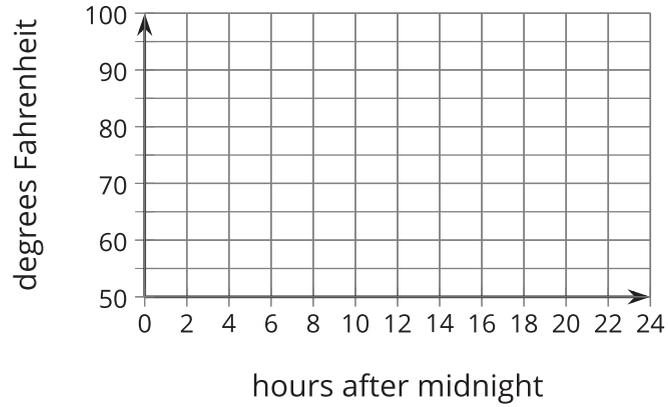
6. Write an equation for  $g(x)$  in terms of  $h(x)$  for any input  $x$ .

### 3 Heating the Kitchen

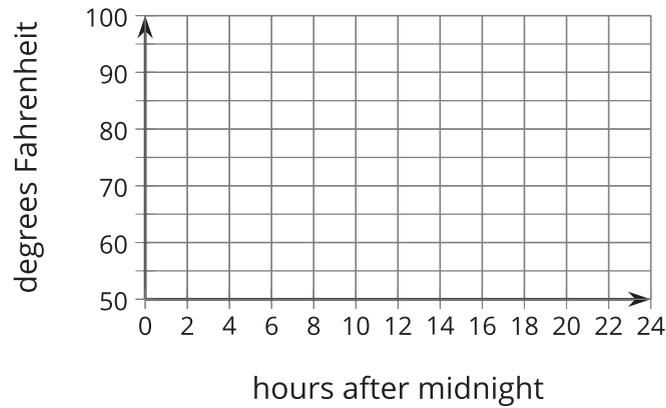
#### Student Task Statement

A bakery kitchen has a thermostat set to  $65^{\circ}\text{F}$ . Starting at 5:00 a.m., the temperature in the kitchen rises to  $85^{\circ}\text{F}$  when the ovens and other kitchen equipment are turned on to bake the daily breads and pastries. The ovens are turned off at 10:00 a.m. when the baking finishes.

1. Sketch a graph of the function  $H$  that gives the temperature in the kitchen  $H(x)$ , in degrees Fahrenheit,  $x$  hours after midnight.



2. The bakery owner decides to change the shop hours to start and end 2 hours earlier. This means the daily baking schedule will also start and end two hours earlier. Sketch a graph of the new function  $G$ , which gives the temperature in the kitchen as a function of time.



3. Explain what  $H(10.25) = 80$  means in this situation. Why is this reasonable?
4. If  $H(10.25) = 80$ , then what would the corresponding point on the graph of  $G$  be? Use function notation to describe the point on the graph of  $G$ .
5. Write an equation for  $G$  in terms of  $H$ . Explain why your equation makes sense.

### Images for Activity Synthesis

