## 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 $f\left(x\right)=x^{2}\left(x−2\right)$ to get to the functions shown here in terms of both the graph and the equation.

1. $h\left(x\right)=x^{2}\left(x−2\right)−5$
2. $g\left(x\right)=\left(x−4\right)^{2}\left(x−6\right)$

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

| * $x$
 | * $f\left(x\right)$
 | * $g\left(x\right)$
 | * $h\left(x\right)=f\left(x\right)−2.5$
 |
| --- | --- | --- | --- |
| * -4
 | * 0
 | *
 | *
 |
| * -3
 | * -5.8
 | *
 | *
 |
| * -0.7
 | * 0
 | *
 | *
 |
| * 1.2
 | * -3.3
 | *
 | *
 |
| * 2
 | * 0
 | *
 | *
 |

1. Sketch the graph of function $h$.
* 
1. Write an equation for $g\left(x\right)$ in terms of $h\left(x\right)$ for any input $x$.

### 3 Heating the Kitchen

#### Student Task Statement

A bakery kitchen has a thermostat set to $65^{∘}F$. Starting at 5:00 a.m., the temperature in the kitchen rises to $85^{∘}F$ 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 $H\left(x\right)$, in degrees Fahrenheit, $x$ hours after midnight.
* 
1. 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.
* 
1. Explain what $H\left(10.25\right)=80$ means in this situation. Why is this reasonable?
2. If $H\left(10.25\right)=80$, then what would the corresponding point on the graph of $G$ be? Use function notation to describe the point on the graph of $G$.
3. Write an equation for $G$ in terms of $H$. Explain why your equation makes sense.

#### Images for Activity Synthesis







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