## Unit 5 Lesson 7: Expressing Transformations of Functions Algebraically

### 1 Describing Translations (Warm up)

#### Student Task Statement

Let $g\left(x\right)=\sqrt{x}$. Complete the table. Be prepared to explain your reasoning.

| words (the graph of $y=g\left(x\right)$ is...) | function notation | expression |
| --- | --- | --- |
| translated left 5 units | $g\left(x+5\right)$ |   |
| translated left 5 units and down 3 units |   | $\sqrt{x+5}−3$ |
|   | $g\left(-x\right)$ | $\sqrt{-x}$ |
| translated left 5 units, then down 3 units,then reflected across the $y$-axis |   |   |

### 2 Translating Vertex Form

#### Student Task Statement

Let $f$ be the function given by $f\left(x\right)=x^{2}$.

1. Write an equation for the function $g$ whose graph is the graph of $f$ translated 3 units left and up 5 units.
2. What is the vertex of the graph of $g$? Explain how you know.
3. Write an equation for a quadratic function $h$ whose graph has a vertex at $\left(1.5,2.6\right)$.
4. Write an equation for a quadratic function $k$ whose graph opens downward and has a vertex at $\left(3.2,-4.7\right)$.

### 3 An Even Better Fit

#### Student Task Statement

In an earlier lesson, we looked at the temperature $T$, in degrees Fahrenheit, of a bottle of soda water left outside for $h$ hours. Let’s model this data with a function. This time, we will start with the function $f\left(h\right)=33\left(0.6\right)^{h}$. This graph has a shape that fits the data well.





1. Describe a translation of this graph that fits the data.
2. Write an equation defining a function $g$ that models the data.
3. What does your function tell you about the temperature outside?



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