## Unit 6 Lesson 13: Amplitude and Midline

### 1 Comparing Parabolas (Warm up)

#### Student Task Statement

Match each equation to its graph.

1. $y=x^{2}$
2. $y=3x^{2}$
3. $y=3(x−1)^{2}$
4. $y=3x^{2}−1$
5. $y=x^{2}−1$

A



B



C



D



E



Be prepared to explain how you know which graph belongs with each equation.

### 2 Blowing in the Wind

#### Student Task Statement



Suppose a windmill has a radius of 1 meter and the center of the windmill is $(0,0)$ on a coordinate grid.

1. Write a function describing the relationship between the height $h$ of $W$ and the angle of rotation $θ$. Explain your reasoning.
2. Describe how your function and its graph would change if:
	1. the windmill blade has length 3 meters.
	2. The windmill blade has length 0.5 meter.
3. Test your predictions using graphing technology.

#### Activity Synthesis



### 3 Up, Up, and Away

#### Student Task Statement

1. A windmill has radius 1 meter and its center is 8 meters off the ground. The point $W$ starts at the tip of a blade in the position farthest to the right and rotates counterclockwise. Write a function describing the relationship between the height $h$ of $W$, in meters, and the angle $θ$ of rotation.
2. Graph your function using technology. How does it compare to the graph where the center of windmill is at $(0,0)$?
3. What would the graph look like if the center of the windmill were 11 meters off the ground? Explain how you know.

#### Images for Activity Synthesis







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