## Unit 6 Lesson 11: Extending the Domain of Trigonometric Functions

### 1 Rewind to the Windmill (Warm up)

#### Images for Launch



#### Student Task Statement

Priya is thinking about the windmill in an earlier lesson. That windmill had a point $P$ at $\left(1,0\right)$ at the end of the blade that starts at 0 radians pointing directly to the right. Priya says that if the blade rotates $-\frac{π}{2}$ radians, then $P$ will be at the lowest point in its circle of rotation.

What do you think Priya means by rotating $-\frac{π}{2}$ radians? Do you agree with Priya? Be prepared to explain your reasoning.

### 2 Math Talk: The Hour Hand

#### Student Task Statement

Here is a clock showing an hour hand at 3 p.m.



Your teacher will give you a time. Identify the radian angle measure that the hour hand rotates through if it starts at 3 p.m.

### 3 The Big Picture for Cosine and Sine

#### Student Task Statement

1. Create a visual display for the following functions. Include a graph of the function from at least $-4π$ to $4π$ radians, the maximum and minimum value of the function, and the period of the function. Label any intersections the graph of the function has with the axes.
	1. $y=cos\left(θ\right)$
	2. $y=sin\left(θ\right)$
2. The $y$-axis is a line of symmetry for one of the two graphs. Which one? Explain how you know.

### 4 Cosine and Sine Together (Optional)

#### Student Task Statement

Use graphing technology to graph the functions $y=cos\left(θ\right)$ and $y=sin\left(θ\right)$ on the same axes.

1. Identify two points where the graphs intersect—one with a negative $θ$-coordinate, and one with a positive $θ$-coordinate. What is the exact $θ$-coordinate for each point? Explain or show how you know.
2. What are the $y$-coordinates of the points of intersection? Explain or show how you know.
3. What could be the value of $cos\left(θ\right)$ if $sin\left(θ\right)=0$? Explain your reasoning.

#### Activity Synthesis





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