Phase & Vertical Shifts in Action

Name: _____ Date: _____

Create, decode, and correct trigonometric equations based on real-world robot motion scenarios.

The equation **y = A sin(Bx - C) + D** represents a transformed sine function.

A is the amplitude (vertical stretch/compression)
B affects the period (horizontal stretch/compression)
C is the phase shift (horizontal translation)
D is the vertical shift

Activity 1: Scenario-Based Modeling

For each robot scenario, write a corresponding trigonometric equation. Then, sketch the graph of your equation and explain how it models the given motion.

Scenario A: The robot arm's resting position is now 3 units higher than usual. The arm swings 1 unit above and below this new resting point. The motion is the same speed as a standard sine wave, and it starts at the midline.

- **Equation:**
  - y= _____
  -
- **Graph:**
- **Explanation:**

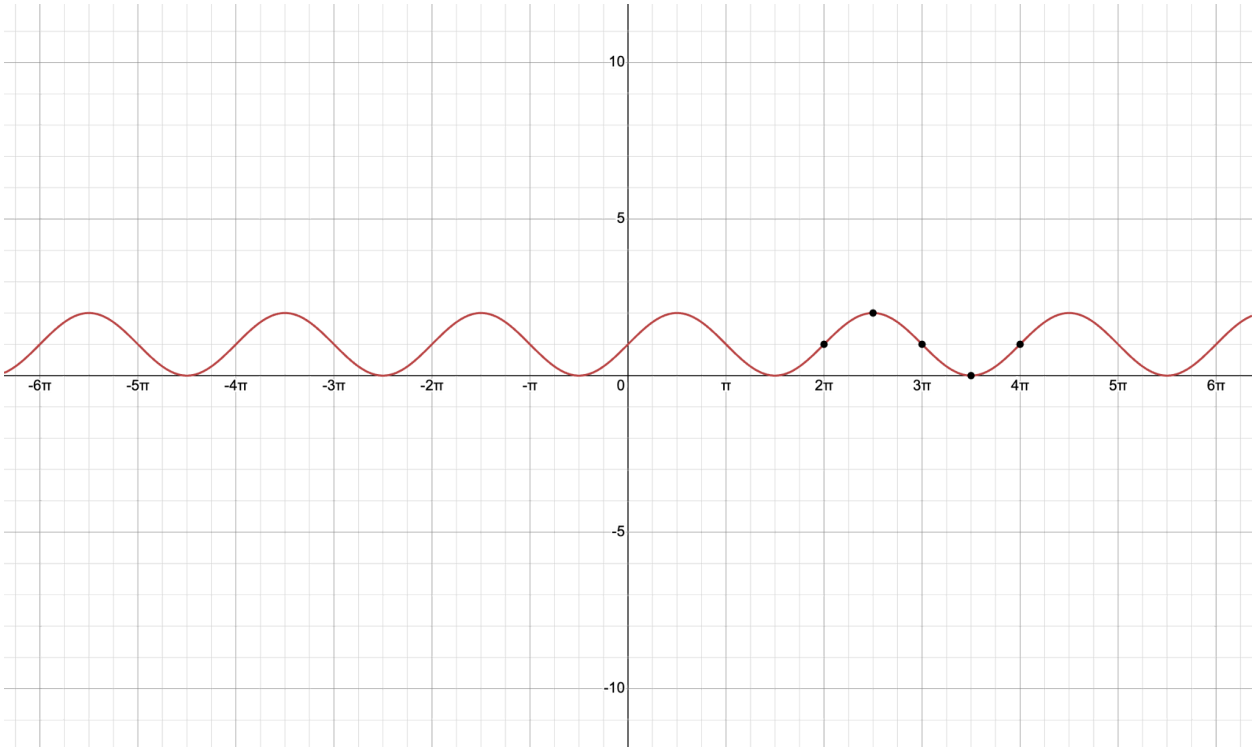
Scenario B: The robot arm starts its sweep 45° later than usual. The arm's midline and amplitude are the same as a standard cosine wave.

- **Equation:**
  - y= _____
- **Graph:**
- **Explanation:**

Activity 2: Mystery Graph Investigation

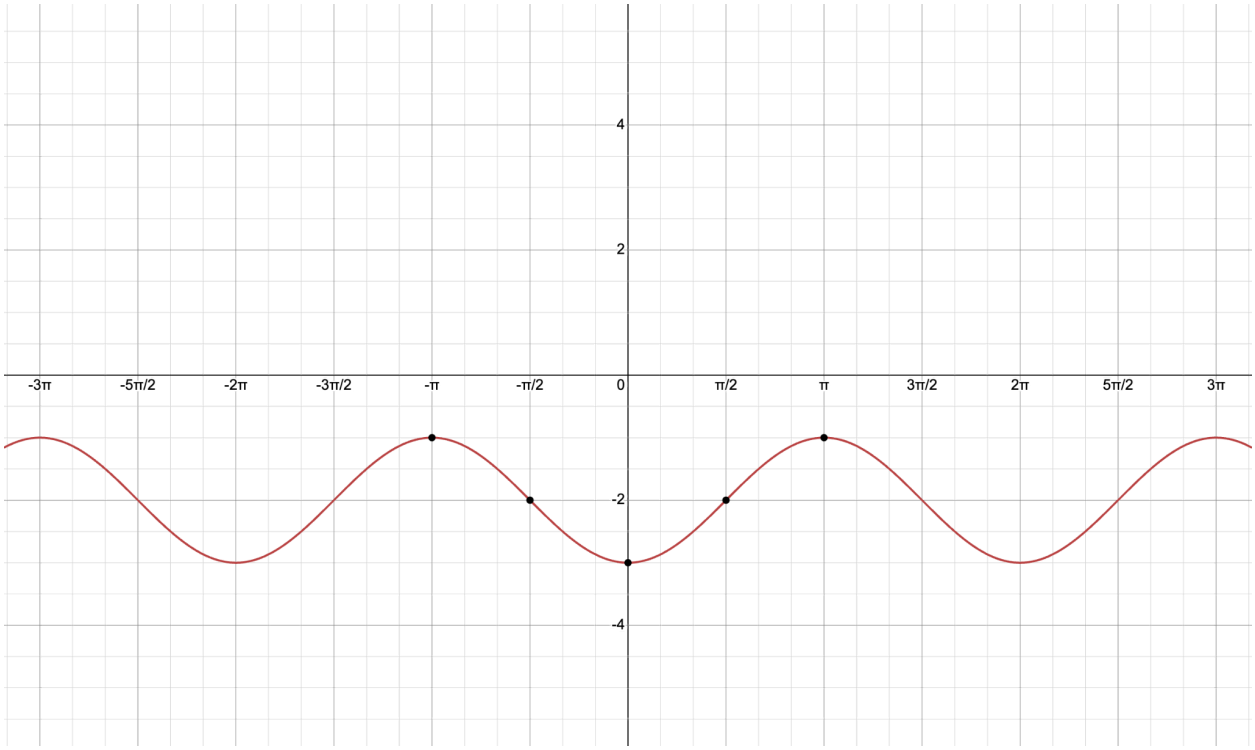
Examine the unlabeled graph below. Your task is to decode the equation that creates this motion.

Mystery Graph #1:



- **Equation:**
  - y= _____
- **Justification:**
  - How did you determine the vertical shift (D)?
  - How did you determine the phase shift (C)?

Mystery Graph #2:



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- **Equation:**
  - y= _____
- **Justification:**
  - How did you determine the vertical shift (D)?
  - How did you determine the phase shift (C)?

Activity 3: Error Analysis

Review the following scenarios. Each one contains an intentional error. Your task is to identify and correct the mistake, then explain the real-world impact of your correction.

Error Analysis A:

- **Scenario:** "A robot arm must start its sweep 2 units later. The equation is y=sin(x+2)."
- **The Error:**
  - What is the mistake?
- **The Correction:**
  - What is the correct equation?

- **The Impact:**
    - How does the correct equation change the robot's motion?

Error Analysis B:

- **Scenario:** "This graph shows a robot arm that starts 1 unit higher than its standard position. Its equation is $y=3\cos(x)-1$."
- **The Error:**
    - What is the mistake?
- **The Correction:**
    - What is the correct equation?
- **The Impact:**
    - How does the correct equation change the robot's motion?