

**PART A: Multiple Choice**

Place the correct answer on the answer sheet provided.

1. Which system of equations has (2,-1) as its solution?

(A) 
$$\begin{cases} 2x - 5y = -12 \\ 3x - 2y = -9 \end{cases}$$

(B) 
$$\begin{cases} x - y = 5 \\ -2x + y = 7 \end{cases}$$

(C) 
$$\begin{cases} 2x - 2y = 6 \\ x + 3y = -1 \end{cases}$$

(D) 
$$\begin{cases} \frac{1}{2}x - 3y = -10 \\ 2x - y = -7 \end{cases}$$

2. What is the
- determinant**
- of the matrix
- $\begin{bmatrix} 4 & -3 \\ -2 & 2 \end{bmatrix}$
- ?

(A) -14

(B) 2

(C) 8

(D) 14

3. What is the
- inverse**
- of the matrix:
- $\begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix}$
- ?

(A)  $\begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$

(B)  $\begin{bmatrix} -5 & 2 \\ 7 & -3 \end{bmatrix}$

(C)  $\begin{bmatrix} -3 & 7 \\ 2 & -5 \end{bmatrix}$

(D)  $\begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$

4. Which of the following matrices does
- not**
- have an inverse?

(A)  $\begin{bmatrix} 2 & -3 \\ 3 & -2 \end{bmatrix}$

(B)  $\begin{bmatrix} 3 & 2 \\ -3 & -3 \end{bmatrix}$

(C)  $\begin{bmatrix} -2 & 0 \\ -1 & 2 \end{bmatrix}$

(D)  $\begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$

5. What is true about the system of equations:
- $\begin{cases} -3x + 4y = 8 \\ 6x - 8y = -8 \end{cases}$
- ?

(A) It has one solution.

(B) It has two solutions.

(C) It has no solutions.

(D) It has an infinite number of solutions.

6. What is
- $\begin{cases} 4x - 3y = 5 \\ 2x - 5y = -1 \end{cases}$
- written as a matrix equation?

(A) 
$$\begin{pmatrix} 4 & -3 \\ 2 & -5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

(B) 
$$\begin{pmatrix} 2 & -5 \\ 4 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

(C) 
$$\begin{pmatrix} 4 & 2 \\ -3 & -5 \end{pmatrix} \begin{pmatrix} 5 \\ -1 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix}$$

(D) 
$$\begin{pmatrix} 2 & -5 \\ 4 & -3 \end{pmatrix} \begin{pmatrix} y \\ x \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

7. Which of the following will produce an identity matrix?

(A)  $A^{-1} \times A^{-1}$

(B)  $A \times A^{-1}$

(C)  $A \times \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(D)  $A^{-1} \times \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

8. The *Call – A – Lot* phone company charges a monthly fee of \$22 plus an additional 25¢ per minute. Which of the following equations represent this phone plan?

(A)  $c = 22m + 25$

(B)  $c = 25m + 22$

(C)  $c = 22m + 0.25$

(D)  $c = 0.25m + 22$

9. Three bars and two bags of chips cost \$4.80. If 1 bar and four bags of chips cost \$5.60, what is the cost for 1 bag of chips?

(A) \$0.75

(B) \$0.80

(C) \$1.00

(D) \$1.20

10. Which of the following is the coefficient matrix for the system:  $\begin{cases} 3x - y = -6 \\ 4x = -3y + 2 \end{cases}$ ?

(A)  $\begin{pmatrix} 3 & -1 \\ 4 & 3 \end{pmatrix}$

(B)  $\begin{pmatrix} 3 & -1 \\ 4 & -3 \end{pmatrix}$

(C)  $\begin{pmatrix} 3 & 4 \\ -1 & 3 \end{pmatrix}$

(D)  $\begin{pmatrix} 3 & 4 \\ -1 & -3 \end{pmatrix}$

11. What is the slope y-intercept form of  $3x - 2y + 10 = 0$ ?

(A)  $y = -\frac{3}{2}x - 5$

(B)  $y = -\frac{3}{2}x + 5$

(C)  $y = \frac{3}{2}x - 5$

(D)  $y = \frac{3}{2}x + 5$

12. What is the product when the following matrices are multiplied?

$$\begin{pmatrix} 1 & 0 & -2 \\ 3 & 4 & 2 \end{pmatrix} \times \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}$$

(A)  $\begin{pmatrix} 7 \\ 5 \end{pmatrix}$

(B)  $\begin{pmatrix} 7 & 5 \end{pmatrix}$

(C)  $\begin{pmatrix} 8 & 17 \end{pmatrix}$

(D)  $\begin{pmatrix} 8 \\ 17 \end{pmatrix}$

13. The weekly charges for two car rental companies are described by the equations:

*Bumpy's Taxi:*  $c = 0.15d + 45$

where;  $c$  is cost in dollars and

*Flight's Taxi:*  $c = 0.10d + 55$

$d$  is distance traveled in kilometers

What is the intersection point of these two plans?

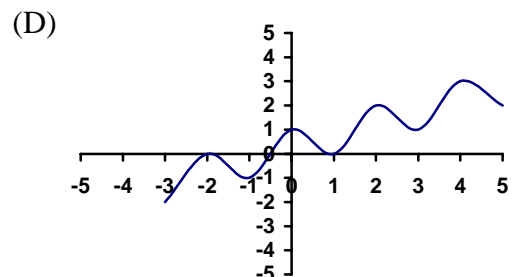
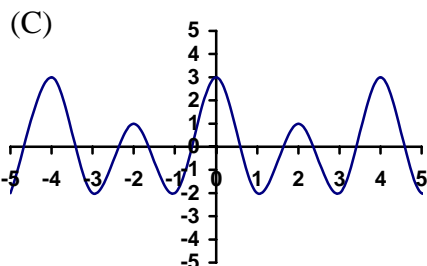
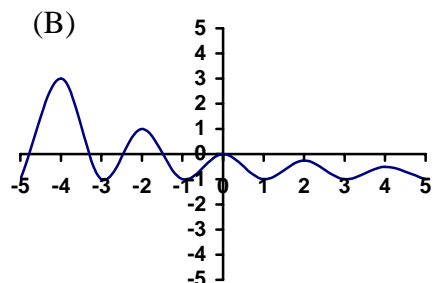
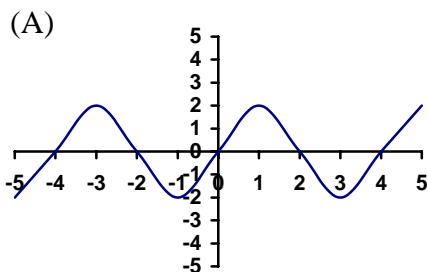
(A) (45, 55)

(B) (100, 60)

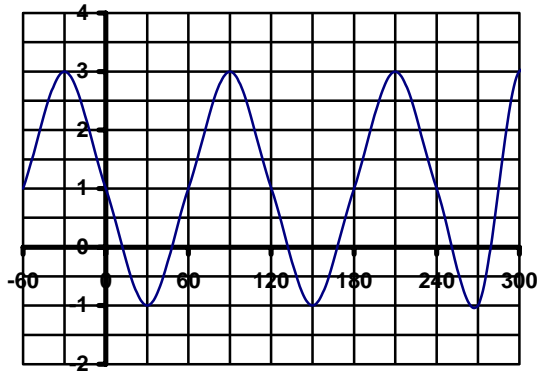
(C) (200, 75)

(D) (400, 95)

14. Which of the following graphs reveals **periodic, but not sinusoidal** behavior?



15. The product of a  $2 \times 3$  matrix and a  $3 \times 4$  matrix will result in what dimensions?  
 (A)  $2 \times 3$                       (B)  $2 \times 4$                       (C)  $3 \times 3$                       (D) not possible
16. What is the horizontal distance from a local maximum to the next local maximum called?  
 (A) Amplitude                      (B) Horizontal Stretch                      (C) Period                      (D) Sinusoidal Axis
17. What is the horizontal stretch for the following?



- (A) 3                      (B)  $\frac{1}{3}$                       (C)  $120^\circ$                       (D)  $-\frac{1}{3}$
18. What is the period of the function:  $\frac{1}{3}(y+1) = \cos 2(x-45^\circ)$ ?  
 (A)  $120^\circ$                       (B)  $180^\circ$                       (C)  $360^\circ$                       (D)  $720^\circ$
19. What is the amplitude of:  $\frac{1}{2}(y-3) = \cos 4(x-90^\circ)$ ?  
 (A)  $\frac{1}{3}$                       (B)  $\frac{1}{2}$                       (C) 2                      (D) 3
20. What is the equation of the sinusoidal axis of:  $2(y+6) = \sin(x-45^\circ)$ ?  
 (A)  $y = -6$                       (B)  $y = -2$                       (C)  $y = 2$                       (D)  $y = 6$
21. Which equation represents the mapping rule:  $(x, y) \rightarrow (x+60, 2y-3)$ ?  
 (A)  $\frac{1}{2}(y+3) = \sin(x-60^\circ)$                       (B)  $\frac{1}{2}(y-3) = \sin(x+60^\circ)$   
 (C)  $2(y+3) = \sin(x-60^\circ)$                       (D)  $2(y-3) = \sin(x+60^\circ)$
22. What is the transformational form of  $y = \frac{1}{3}\sin(x-30^\circ)-2$ ?  
 (A)  $\frac{1}{3}(y-2) = \sin(x-30^\circ)$                       (B)  $\frac{1}{3}(y+2) = \sin(x-30^\circ)$   
 (C)  $3(y-2) = \sin(x-30^\circ)$                       (D)  $3(y+2) = \sin(x-30^\circ)$
23. What is the maximum value of  $\frac{1}{4}(y-1) = \cos 6(x+30^\circ)$ ?  
 (A)  $y = 3$                       (B)  $y = 4$                       (C)  $y = 5$                       (D)  $y = 6$

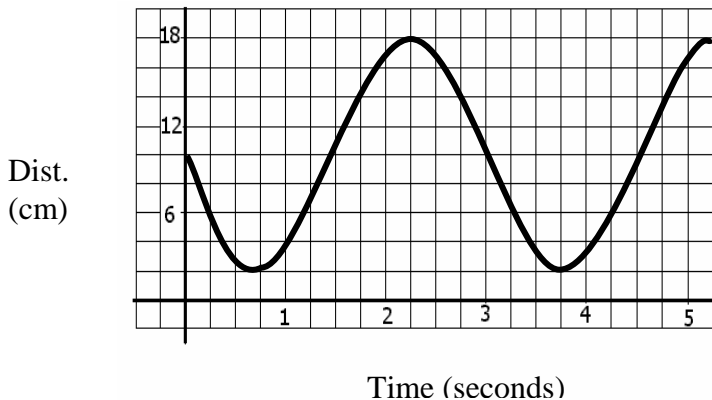
24. A Ferris wheel has a radius of 8 meters. To get on this Ferris wheel you must first stand on a platform, which is 3 meters above the ground. What is the sinusoidal axis of the graph for this situation?

(A)  $y = 5$                       (B)  $y = 8$                       (C)  $y = 11$                       (D)  $y = 16$

25. A ping pong paddle is moved back and forth in front of a motion detector in a regular, repetitive motion. The device records the distance between the paddle and the detector as well as the time. The data produced the following two graphs during two different trials.

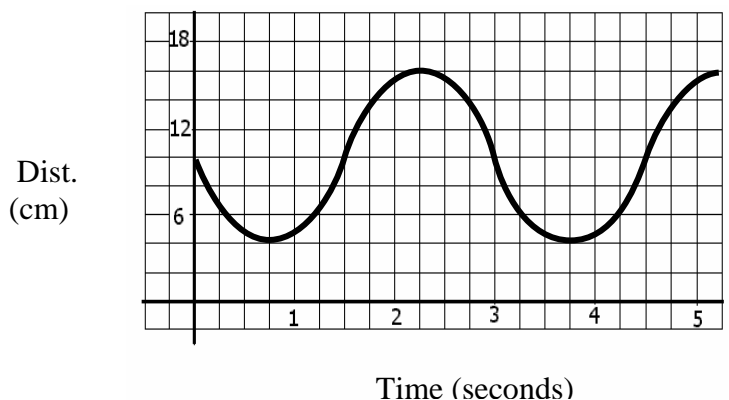
DATA #1

Distance vs. Time for a Ping Pong



DATA #2

Distance vs. Time for a Ping Pong



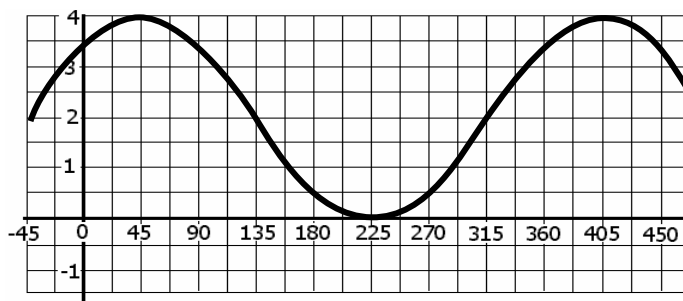
What is the only difference in these two graphs?

(A) Amplitude                      (B) Horizontal stretch                      (C) Period                      (D) Sinusoidal axis

26. What is the vertical distance from the sinusoidal axis to a local minimum called?

(A) Amplitude                      (B) Horizontal stretch (C) Period                      (D) Sinusoidal axis

Questions #27 – 29 are based on the graph below.



27. What is the horizontal translation for cosine in this graph?

(A)  $135^\circ$                       (B)  $45^\circ$                       (C)  $225^\circ$                       (D)  $-45^\circ$

28. What is the period of this sinusoidal function?

(A)  $45^\circ$                       (B)  $180^\circ$                       (C)  $360^\circ$                       (D)  $405^\circ$

29. Which equation describes this sinusoidal function?

(A)  $\frac{1}{2}(y - 2) = \cos(x - 45^\circ)$                       (B)  $\frac{1}{2}(y + 2) = \cos(x + 45^\circ)$   
 (C)  $2(y - 2) = \cos(x - 45^\circ)$                       (D)  $2(y + 2) = \cos(x + 45^\circ)$

30. What is the vertical stretch of  $-\frac{2}{3}(y + 2) = \cos(x - 10^\circ)$ ?

(A)  $\frac{2}{3}$                       (B)  $\frac{3}{2}$                       (C)  $-\frac{2}{3}$                       (D)  $-\frac{3}{2}$

**PART B: Constructed Response**

Answer **ALL** questions in the space provided. Show all workings to receive full credit.

31. Solve the following system of equations using **substitution** method.

$$\begin{cases} 3x - y = 3 \\ 6x + 5y = -8 \end{cases}$$

32. Solve the following system by **graphing**. State the slope and y-intercept of each line.

$$\begin{cases} x + 2y - 6 = 0 \\ 9x + 3y = -6 \end{cases}$$

Line 1 \_\_\_\_\_

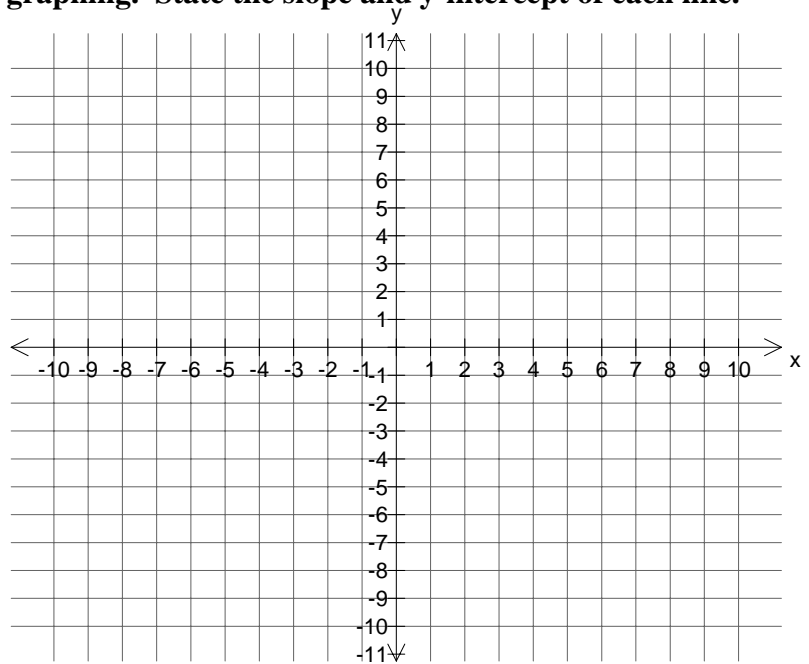
Slope \_\_\_\_\_

y-intercept \_\_\_\_\_

Line 2 \_\_\_\_\_

Slope \_\_\_\_\_

y-intercept \_\_\_\_\_



33. There were 375 students from Holy Spirit High School who attended the first game of the Shield. There were 93 more boys than girls. Set up a system of equations to represent this situation and use this system to algebraically determine the number of boys and girls at the game.

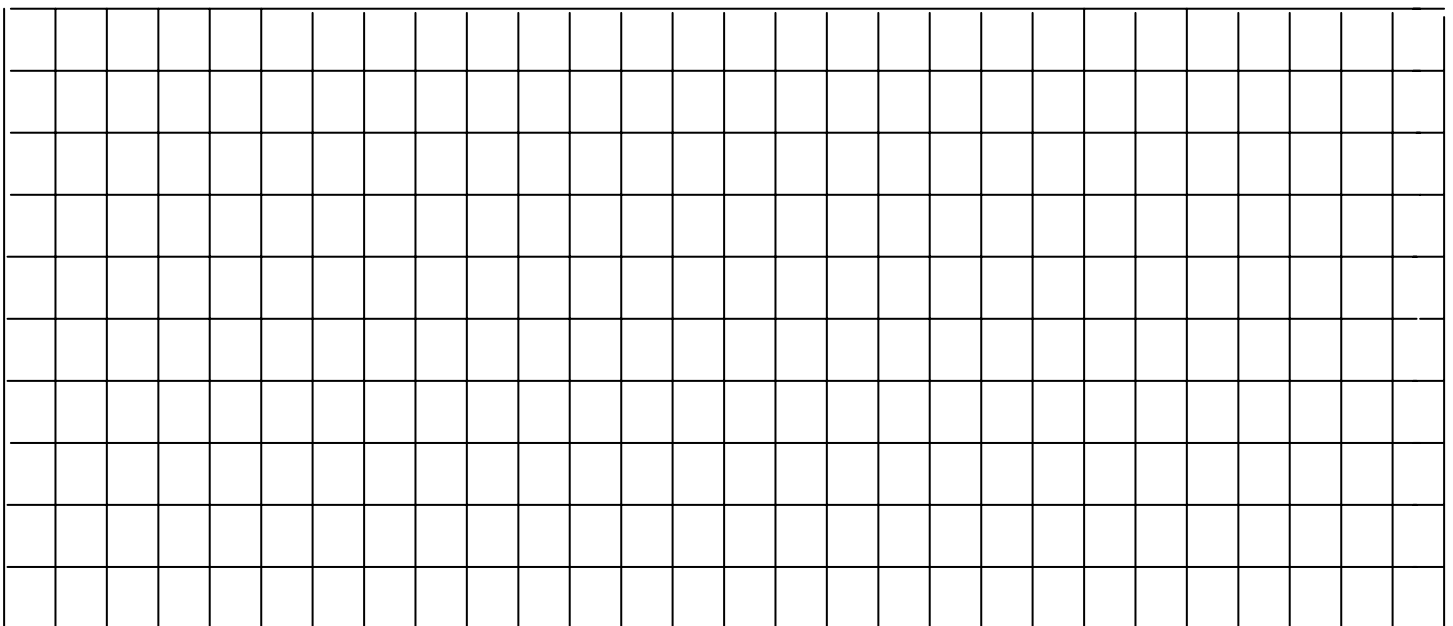
34. **Algebraically** solve the following system.

$$\begin{cases} 2x + 3y - 4z = -1 \\ 3x - 2y + z = -7 \\ -x + y - z = 2 \end{cases}$$

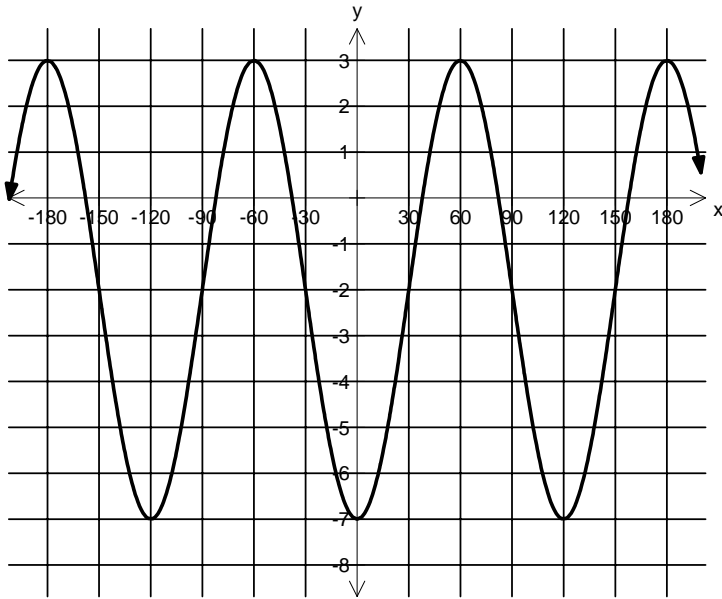
34. Graph the equation  $\frac{1}{4}(y-1) = \cos 2(x+45^\circ)$  using the mapping rule method.

Mapping Rule:  $(x, y) \rightarrow ( \quad , \quad )$

<b>X</b>	<b>Y</b>
0°	
90°	
180°	
270°	
360°	

35. Determine the equation of the sinusoidal function given below as a transformation of  $y = \sin x$ .

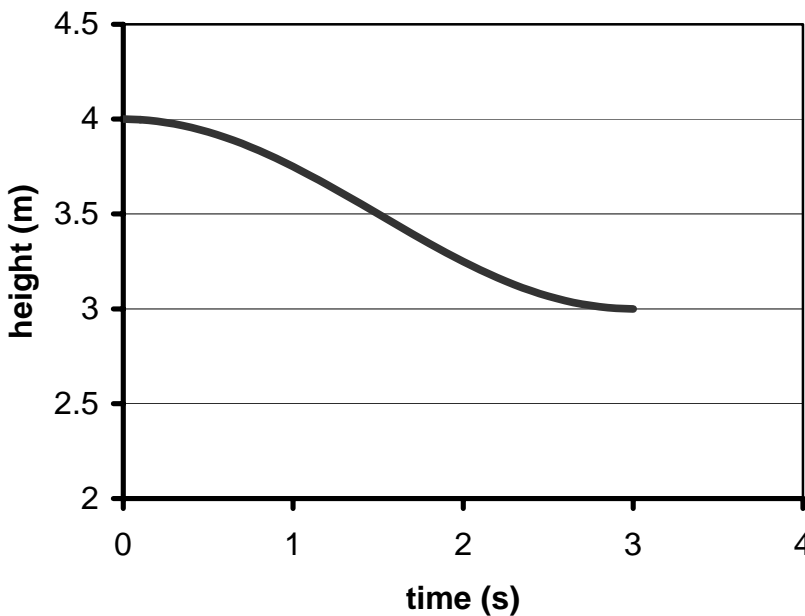


VS \_\_\_\_\_ Amplitude \_\_\_\_\_  
 Sinusoidal \_\_\_\_\_  
 VT \_\_\_\_\_ Axis \_\_\_\_\_  
 HS \_\_\_\_\_ Period \_\_\_\_\_  
 HT \_\_\_\_\_ Starting Point \_\_\_\_\_

Equation in terms of SINE:

\_\_\_\_\_

37. Bill was waterskiing on Cayuga Lake when lost his balance and fell into water, bobbing up and down. When he was on the crest of the wave, Bill's feet were 4 meters above the bottom of the lake. After 3 seconds, Bill was in the trough of the wave, which is 3 meters above the bottom of the lake. Determine the equation that describes Bill's motion in terms of **cosine**. What was his height after 15 seconds?



VS \_\_\_\_\_ Amplitude \_\_\_\_\_  
 Sinusoidal \_\_\_\_\_  
 VT \_\_\_\_\_ Axis \_\_\_\_\_  
 HS \_\_\_\_\_ Period \_\_\_\_\_  
 HT \_\_\_\_\_ Starting Point \_\_\_\_\_

Equation in terms of COSINE:

\_\_\_\_\_

38. Simplify

(A)  $2\sqrt{32} - 3\sqrt{27} + \sqrt{18} - \frac{3}{7}\sqrt{98}$

(B)  $\frac{\sqrt{2}+1}{6-3\sqrt{2}}$

(C)  $\frac{2x^2+5x+2}{x^2-4} \div \frac{2x^2+x}{x^2+x-6}$

(D)  $\frac{3x+9}{x^2-5x+4} + \frac{x+3}{x-1}$