

Bergenfield High School
Bergenfield, New Jersey

Mathematics Department

Summer Course Work

in preparation for

AP Calculus BC

Completion of this summer work
is required on the first day of the
2026-2027 school year.

Bergenfield Public Schools
Mathematics Department
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June 2026

Dear Parents and Guardians:

Attached are the summer curriculum review materials for AP *Calculus BC*. This packet was prepared by the Bergenfield High School Math department and contains topics that reflect content learned in prerequisite courses. These materials must be completed and brought to class on the first day of school in September.

Your child is required to complete this packet over the summer. A test based on the material in the packet will be given to your child during the second week of school. It will count as the first test of the year and the grade will be determined as follows:

Completion of the packet on time will count 20% of the grade
Performance on the test will count 80% of the grade.

Thank you for your cooperation.

Sincerely,

Robert Ragasa
Principal

Steve Neff
Director of Mathematics

Show all work on a separate piece of paper.

1. Find the equation of the line that is parallel to $2x + 5y = 8$ and passes through the point $(-1, 0)$

- a. $y = \frac{2}{5}x + \frac{2}{5}$
- b. $y = -\frac{5}{2}x + \frac{2}{5}$
- c. $y = \frac{5}{2}x + \frac{5}{2}$
- d. $y = -\frac{2}{5}x + \frac{2}{5}$
- e. $y = -\frac{2}{5}x - \frac{2}{5}$

2. Find the domain of the function $f(x) = \sqrt{4 - x}$

- a. $[4, \infty)$
- b. $(-\infty, 4)$
- c. $(4, \infty)$
- d. $(-\infty, 4]$
- e. $(-4, 4)$

3. Given the function $f(x) = 2x^2 - 3x$, calculate $\frac{f(a+h) - f(a)}{h}$

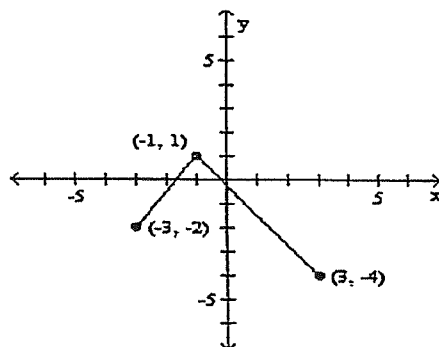
- a. $4a - 3 + h$
- b. $4a - 3 - h$
- c. $4a - 3 - 3h$
- d. $4a - 3 - 2h$
- e. $4a - 3 + 2h$

4. Find $f(-1) + f(4)$ given the function

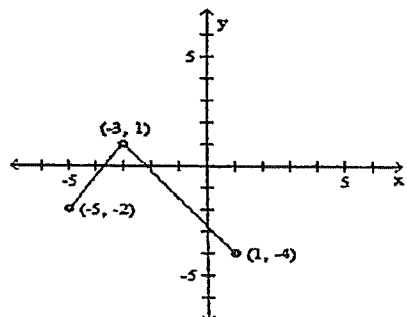
$$f(x) = \begin{cases} x^2 + 1 & \text{if } x < 1 \\ 3 & \text{if } x = 1 \\ 3x - 1 & \text{if } x > 1 \end{cases}$$

- a. 3
- b. 4
- c. 11
- d. 13
- e. 14

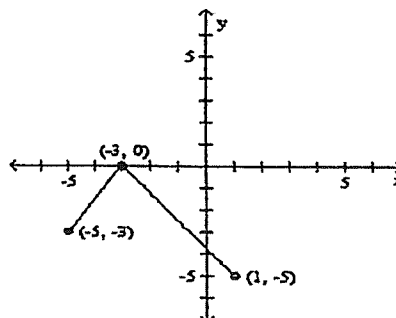
5. The graph of the function $y = f(x)$ is given below. Select the answer choice that represents the graph $y = f(x + 2) - 1$.



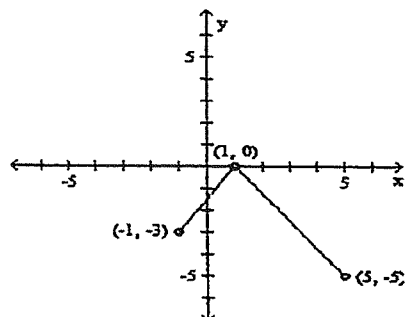
A)



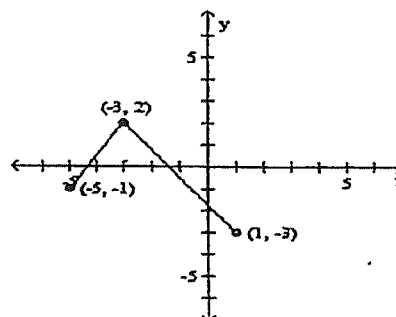
B)



C)



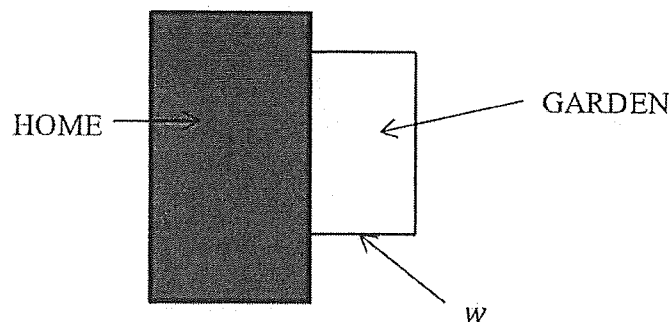
D)



E. None of the above.

6. Which of the following functions has an inverse function on the domain $(-\infty, \infty)$
- I. $f(t) = t^4$
 - II. $g(t) = 1 + 3t$
 - III. $h(t) = \sin(t)$
- a. I only
 - b. II only
 - c. III only
 - d. II and III only
 - e. I and II only
7. If $(2, -5)$ is a point on the graph of $f(x)$, which of the following points MUST be on the graph of $y = \frac{1}{3}f(x - 1)$
- a. $(\frac{2}{3}, -4)$
 - b. $(1, -5)$
 - c. $(\frac{1}{3}, -5)$
 - d. $(1, -\frac{5}{3})$
 - e. $(3, -\frac{5}{3})$
8. Find $f^{-1}(x)$ if $f(x) = \frac{2}{3x+1}$
- a. $f^{-1}(x) = \frac{2+x}{3x}$
 - b. $f^{-1}(x) = \frac{2-x}{3x}$
 - c. $f^{-1}(x) = \frac{3x+1}{2}$
 - d. $f^{-1}(x) = \frac{2x+1}{3}$
 - e. $f^{-1}(x) = \frac{2x-1}{3}$
9. The vertex of the parabola, given by the equation $h(x) = kx^2 - x + 1$, where k is a positive constant, is
- a. $(\frac{1}{2k}, -\frac{1}{4k})$
 - b. $(\frac{1}{2k}, \frac{1}{4k} + 1)$
 - c. $(\frac{1}{2k}, -\frac{1}{4k} + 1)$
 - d. $(-\frac{b}{2}, -\frac{1}{4k} + 1)$
 - e. None of the above

10. Given that $x = -1$ is a zero of the polynomial $f(x) = 16x^3 - 13x + 3$, what is the **sum** of the other zeros of $f(x)$?
- 1
 - 2
 - 3
 - 4
 - 5
11. Find the inverse function of $f(x) = 2^{x+2}$
- $f^{-1}(x) = \frac{1}{2^{x+2}}$
 - $f^{-1}(x) = -2^{x+2}$
 - $f^{-1}(x) = \log_2(x + 2)$
 - $f^{-1}(x) = -2 + \log_2(x)$
 - None of the above
12. Find the range of the function $g(x) = -e^{x-a} + b$, where a and b are some positive integers.
- $(-\infty, \infty)$
 - $(-\infty, 0)$
 - $(0, \infty)$
 - (b, ∞)
 - $(-\infty, b)$
13. Bob is making a rectangular garden next to his home. He has 100 feet of fencing and plans to use the side of the home as one side of the garden (see the figure). Assume that the width of the garden is w . Write the area of the garden A as a function of w .



- $A = 10000 - 2w$
- $A = 100w - w^2$
- $A = w(100 - 2w)$
- $A = 2w^2$
- $A = 100 - 2w^2$

14. Find the domain of the function $f(x) = \ln(x - 1) + 3$

- a. $(-\infty, \infty)$
- b. $(3, \infty)$
- c. $(-\infty, 1)$
- d. $(1, \infty)$
- e. $(1, 3)$

15. If $f(x) = 1 + \frac{1}{x}$ and $g(x) = x - 1$, find $(f \circ g)(x)$

- a. $\frac{x}{x-1}$
- b. x
- c. $x - 1$
- d. $\frac{1}{x}$
- e. $\frac{x+2}{x-1}$

16. The remainder R when $f(x) = 20x^{30} - 4x^3 + x^2 - 3x + 2$ is divided by $x + 1$ is

- a. $R = 30$
- b. $R = 20$
- c. $R = 12$
- d. $R = 16$
- e. $R = 22$

17. If $f(x) = 1 + \frac{1}{x}$ and $g(x) = x + 1$, find $(\frac{f}{g})(x)$

- a. $\frac{x}{x+1}$
- b. x
- c. $x + 1$
- d. $\frac{1}{x}$
- e. $\frac{x+2}{x+1}$

18. The value of $\log_3 27$ is

- a. 1
- b. 2
- c. 3
- d. 4
- e. None of the above

19. Find the horizontal asymptote (H.A.) and vertical asymptote(s) (V.A.) of

$$f(x) = \frac{x^2 + x - 2}{3x^2 - 4x - 20}$$

- a. V.A. $x = -2$; H.A. $y = 1$
- b. V.A. $x = -2$; H.A. $y = \frac{1}{3}$
- c. V.A. $x = -2$ and $x = \frac{10}{3}$; H.A. $y = 1$
- d. V.A. $x = \frac{10}{3}$; H.A. $y = \frac{1}{3}$
- e. V.A. $x = -2$ and $x = -\frac{10}{3}$; H.A. $y = 1$

20. Find the oblique asymptote of the function $f(x) = \frac{x^3 - 1}{x^2 - x + 1}$

- a. $y = x$
- b. $y = x + 1$
- c. $y = x - 1$
- d. $y = x + 2$
- e. $y = 2x + 1$

21. Find the domain of the function $f(x) = \frac{x-3}{2x+8} - 5$

- a. $(-\infty, 4)$
- b. $(-\infty, -4)$
- c. $(-\infty, -4) \cup (-4, \infty)$
- d. $(3, \infty)$
- e. $(-\infty, \infty)$

22. Solve the following inequality

$$\frac{1-x}{x-2} + 1 > 0$$

- a. $(-\infty, 1) \cup (2, \infty)$
- b. $(-\infty, 2)$
- c. $(2, \infty)$
- d. $(-\infty, 1] \cup (2, \infty)$
- e. $[1, 2)$

23. Solve the following inequality

$$x^2 + 2x - 8 < 0$$

- a. $(-\infty, -4)$
- b. $(-4, 2)$
- c. $(-\infty, -4) \cup (2, \infty)$
- d. $(-\infty, -4) \cup [2, \infty)$
- e. $(-\infty, -4] \cup (2, \infty)$

24. Solve the equation $3^{2x^2-5x} = 27$

- a. $x = 3$
- b. $x = 2$
- c. $x = 3$ and $x = -0.5$
- d. $x = -0.5$
- e. $x = 5$ and $x = -0.5$

25. Convert the equation $2^3 = 8$ to logarithmic form

- a. $\log_8 2 = 3$
- b. $\log_8 3 = 2$
- c. $\log_2 3 = 8$
- d. $\log_2 8 = 3$
- e. $\log_3 8 = 3$

26. If a certain amount of money is invested in a bank account at an interest rate of 8% per year, compounded continuously, how many years (t) will it take for the money to double? The value of t lies in

- a. $0 < t \leq 5$
- b. $5 < t \leq 7$
- c. $7 < t \leq 9$
- d. $9 < t \leq 11$
- e. $11 < t \leq 13$

27. Solve $\log_2(3-x) + \log_2(-x) = 2$

- a. $x = -1, x = 4$
- b. $x = -1$
- c. $x = 4$
- d. $x = 1, x = 4$
- e. None of the above

28. Rewrite the expression as a single logarithm (a is a positive constant)

$$\log_a(2a) + \log_a(1) + \frac{1}{2}\log_a(16) - \log_a(a)$$

- a. 1
- b. $\log_a(2)$
- c. $\log_a(8)$
- d. $\log_a(4)$
- e. $\log_a(10)$

29. Convert 140° to radians

- a. $\frac{2\pi}{3}$
- b. $-\frac{5\pi}{6}$
- c. $\frac{6\pi}{7}$
- d. $\frac{7\pi}{9}$
- e. $\frac{7\pi}{6}$

30. Find the exact value of $\cos(-\frac{9\pi}{4})$

- a. $\frac{1}{2}$
- b. $-\frac{1}{\sqrt{2}}$
- c. $\frac{\sqrt{3}}{2}$
- d. $\frac{1}{\sqrt{2}}$
- e. $-\frac{\sqrt{3}}{2}$

31. Find the angle co-terminal with $\frac{17\pi}{3}$

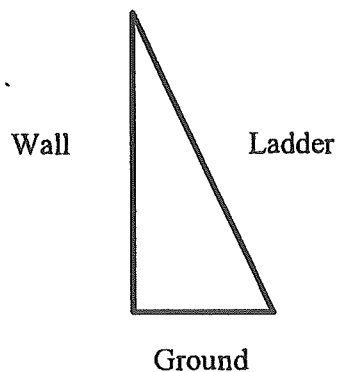
- a. $\frac{\pi}{3}$
- b. $-\frac{\pi}{3}$
- c. $-\frac{17\pi}{3}$
- d. $-\frac{2\pi}{3}$
- e. $\frac{2\pi}{3}$

32. Find $\cos(2\theta)$ if $\sin(\theta) = -\frac{3}{5}$

- a. 1
- b. $\frac{7}{25}$
- c. $-\frac{7}{25}$
- d. $\frac{12}{25}$
- e. $\frac{6}{5}$

33. A ladder of length L leans against a vertical wall. The foot of the ladder makes an angle of 70° with the ground. How far is the foot of the ladder from the wall (X)?

- a. $X = \frac{L}{\cos 70^\circ}$
- b. $X = L \sin 70^\circ$
- c. $X = L \tan 70^\circ$
- d. $X = L \cos 70^\circ$
- e. $X = \frac{L}{\sin 70^\circ}$



34. Simplify $\frac{\sin(2x)}{1+\cos(2x)}$

- a. $\frac{\pi}{2}$
- b. x
- c. 1
- d. $\tan(2x)$
- e. $\tan(x)$

35. Simplify $(1 + \tan^2 x)(1 + \cos 2x)$

- a. 1
- b. 2
- c. $\sin x + \cos x$
- d. $\tan x$
- e. None of the above

36. Find the exact value of $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

- a. $\frac{\pi}{6}$
- b. $-\frac{\pi}{6}$
- c. 0
- d. $-\frac{\pi}{3}$
- e. 1

37. Simplify $\frac{1}{1+\cos(-x)} + \frac{1}{1-\cos(x)}$
- $2 \csc^2(x)$
 - 2
 - $2 \sin^2(x)$
 - $2 \cos(x)$
 - 0
38. Simplify $\cos(-k) \sin(2k) - \sin(-k) \cos(2k)$ using an appropriate trigonometric identity.
- $\cos 3k$
 - $\cos k$
 - $\sin k$
 - $\sin 3k$
 - None of the above
39. Use the appropriate sum or difference identity to find the exact value of $\cos(-\frac{7\pi}{12})$
- $\frac{\sqrt{2}-\sqrt{6}}{4}$
 - $\frac{\sqrt{2}+\sqrt{6}}{4}$
 - $\frac{\sqrt{6}-\sqrt{2}}{4}$
 - $\frac{\sqrt{6}+\sqrt{2}}{2}$
 - None of the above
40. What is the **range** of the function $f(x) = \csc(2x)$
- $(-\infty, \infty)$
 - $(-\infty, -1] \cup [1, \infty)$
 - $(-\infty, -2] \cup [2, \infty)$
 - $[1, \infty)$
 - $[2, \infty)$
41. Find the period and phase shift of $f(x) = 2\sin(3x + \pi)$
- Period = $\frac{2\pi}{3}$, Phase shift = $-\pi$
 - Period = 3, Phase shift = $-\frac{\pi}{3}$
 - Period = $\frac{2\pi}{3}$, Phase shift = $-\frac{\pi}{3}$
 - Period = 6π , Phase shift = π
 - Period = $\frac{2\pi}{3}$, Phase shift = $\frac{\pi}{3}$

42. Find the general solution to the equation $2\cos(2\theta) + 1 = 0$ is

- a. $\theta = \frac{\pi}{3}; \theta = \frac{2\pi}{3}$
- b. $\theta = \frac{\pi}{3} + 2k\pi; \theta = \frac{2\pi}{3} + 2k\pi$
- c. $\theta = \frac{\pi}{3} + k\pi; \theta = \frac{2\pi}{3} + k\pi$
- d. $\theta = 2k\pi$
- e. $\theta = \frac{\pi}{2} + k\pi; \theta = \frac{2\pi}{3} + k\pi$

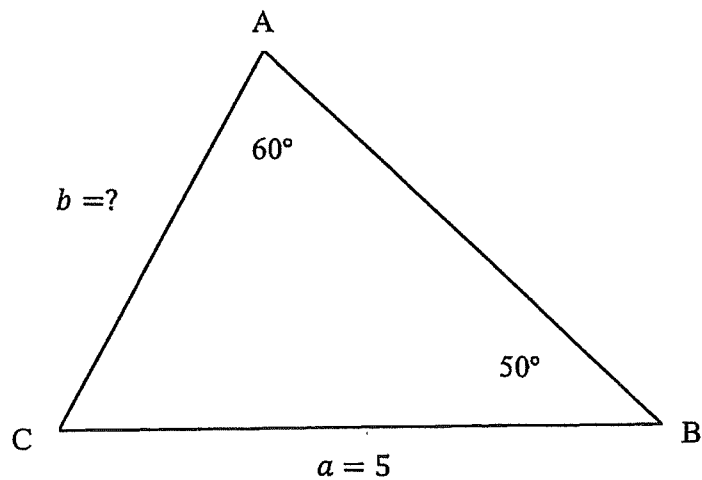
43. Find the exact value of $\tan(\sin^{-1}(\frac{1}{\sqrt{2}}))$.

- a. $\frac{\pi}{4}$
- b. $-\frac{\pi}{4}$
- c. 1
- d. 0
- e. -1

44. For what values of x in the interval $(-\pi, \pi)$ does the graph of $f(x) = \csc(2x + \frac{\pi}{2})$ have vertical asymptotes? (Angles are measured in radians)

- a. $x = -\frac{3\pi}{2}, -\frac{\pi}{6}, \frac{\pi}{6}, \frac{3\pi}{2}$
- b. $x = -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$
- c. $x = -\frac{\pi}{4}, \frac{\pi}{4}$
- d. $x = -\frac{3\pi}{4}, -\frac{\pi}{4}, \frac{\pi}{4}, \frac{3\pi}{4}$
- e. $x = -\frac{3\pi}{4}, \frac{3\pi}{4}$

45. Use the Law of Sines to find the missing side b in the figure below. Round your answer to the nearest decimal digit.



- a. 4.4
 - b. 4.2
 - c. 4.1
 - d. 5.7
 - e. 5.6
46. Suppose that $\sin \theta = -\frac{2}{5}$ and θ is in Quadrant 4. Evaluate $\sec \theta$
- a. $\frac{-2}{\sqrt{29}}$
 - b. $\frac{5}{\sqrt{21}}$
 - c. $\frac{\sqrt{29}}{2}$
 - d. $\frac{\sqrt{21}}{5}$
 - e. $-\frac{5}{\sqrt{21}}$

47. Find the solutions to the equation $\tan(\theta) - \frac{1}{\sqrt{3}} = 0$ in the interval $(0, 2\pi)$

a. $\theta = \frac{\pi}{6} + k\pi$

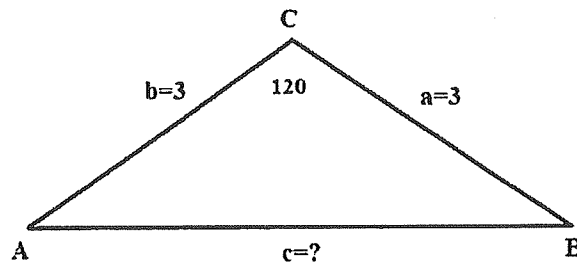
b. $\theta = \frac{\pi}{6}; \theta = \frac{7\pi}{6}$

c. $\theta = \frac{\pi}{6}; \theta = \frac{11\pi}{6}$

d. $\theta = \frac{\pi}{6}; \theta = -\frac{7\pi}{6}$

e. $\theta = \frac{\pi}{6}$

48. Use the Law of Cosines to find the length of the side c in the triangle ABC where $a = 3, b = 3$ and $\angle ACB = 120^\circ$



a. $\sqrt{27}$

b. 27

c. $\sqrt{18 - 9\sqrt{3}}$

d. $\sqrt{18 + 9\sqrt{3}}$

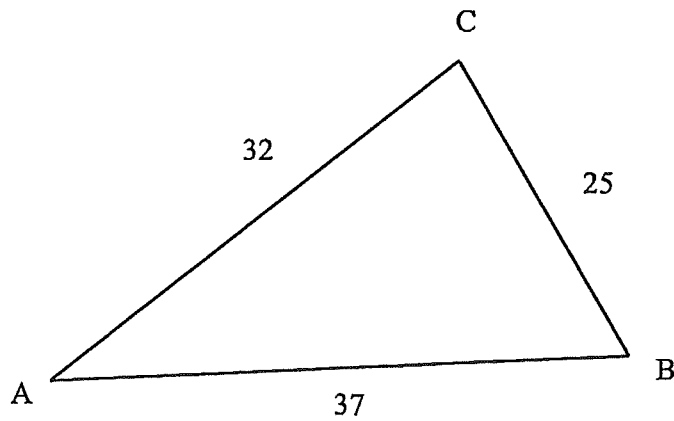
e. $\sqrt{10}$

49. If $(\sin x + \cos x) = \frac{1}{2}$, what is the value of $\sin x \cdot \cos x$?

- a. $\frac{1}{2}$
- b. $\frac{1}{4}$
- c. $\frac{3}{8}$
- d. $-\frac{3}{8}$
- e. $-\frac{1}{2}$

[Hint: Square both sides]

50. Use the Law of Cosines to find the measure of angle A (rounded to the nearest degree) in the figure below.



- a. $A = 30^\circ$
- b. $A = 37^\circ$
- c. $A = 39^\circ$
- d. $A = 42^\circ$
- e. $A = 44^\circ$

Part II. Short Answer Section: Show your work.

1. Find the difference quotient: $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$ for $f(x) = 5x - x^2$.

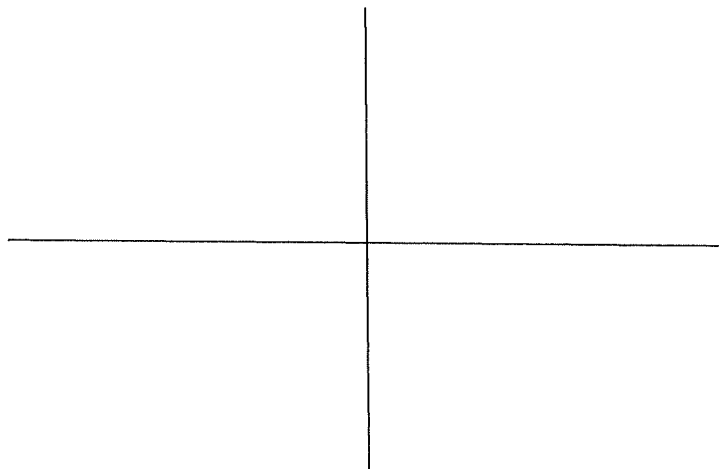
2. The graph of $f(x) = \sqrt{x}$ is shifted up 3 units, right 4 units, reflected about the y-axis, and compressed vertically by a factor of 3. Name the resulting function g , then write an equation for $g(x)$ in terms of f .

3. Describe the transformations that would produce the graph of g from the graph of f . Be specific and detailed. If more than one transformation is needed, specify the order in which the transformations should be applied.
 - a. $g(x) = f(2x) + 7$

 - b. $g(x) = -f(x - 3) - 5$

4. Find the compositions $(f \circ g)(x)$ and $(g \circ f)(x)$ using the following functions: $f(x) = \sqrt[3]{x - 5}$ and $g(x) = x^3 + 1$. Are $f(x)$ and $g(x)$ inverse functions of each other? Explain why or why not.

5. Given the function. $f(x) = x^3 + 2x^2 + 4x + 8$.
- a. Factor the polynomial over the real numbers as the product of linear factors or irreducible quadratic factors.
 - b. State all zeros (real and imaginary) and their associated multiplicities.
 - c. State the end behavior.
 - d. Find the y-intercept.
 - e. Using the information in parts a – d above as a guide, sketch $f(x)$.



6. Find all asymptotes that exist (vertical, horizontal and/or slant) for the following function: $f(x) = \frac{-4x^2+1}{x^2+x-2}$. If they do not exist, explain why. State the domain for the function.

Vertical

Horizontal

Slant

Domain:

7. Solve the following exponential and logarithmic equations. Leave answers in exact form:

a. $8^x = 32^{x-1}$

b. $5^x + 8 = 26$

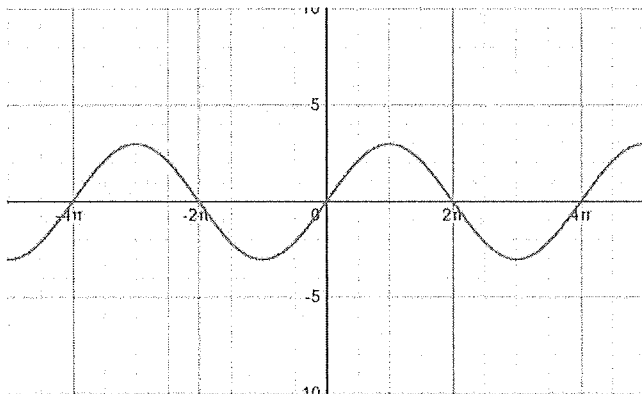
c. $\log_2 x + \log_2(x+2) = \log_2(x+6)$

d. $\log(8x) - \log(x+1) = 2$

8. Given $\sin \theta = -\frac{12}{15}$ and θ terminates in Quadrant III, find the five remaining trigonometric functions of θ .

9. Solve the following non-linear system: $\begin{cases} x - 2y = -6 \\ x^2 - y = 0 \end{cases}$ by substitution.

10. Write a trigonometric function matching the graph below using a **sine** function:



11. Given the following trigonometric function: $y = 2 + 2 \sec(x - \frac{\pi}{4})$

Find the period, amplitude, horizontal translation, and vertical translation.

Amplitude:

Period:

Horizontal Translation:

Vertical Translation:

12. Solve the trigonometric equations:

a. $\csc^2 x + 3 \csc x - 4 = 0$ over $[0, 2\pi)$

b. $2 \sin^2 x + 5 \cos x - 4 = 0$

c. $2 \sin 2x + \sqrt{3} = 0$ over $[0, 2\pi)$

d. $\sec 4x - 2 = 0$