

## Monroe Township High School Mathematics Department

**To:** AP Calculus AB  
**Re:** Summer Project 2026-2027  
**Date:** June 2026

To help begin your study of Calculus, you will be required to complete a review project this summer. This project consists of problems that review important concepts from Algebra, Geometry and Precalculus. The purpose of this assignment is to keep your skills sharp so that you will be successful next year.

### **Please follow these directions very carefully.**

1. **All students must complete the problems in this packet independently and document their OWN work!** You may collaborate and share ideas with other students, **but you alone are responsible for documenting your own work.**
2. **DUE DATE: SEPTEMBER 3, 2026 (THE FIRST DAY OF SCHOOL FOR THE 2026-2027 SCHOOL YEAR)**
3. There will be an assessment on all material covered in this packet on the **third class meeting which is SEPTEMBER 8, 2026. THIS WILL BE A NON-CALCULATOR ASSESSMENT.**
4. You are encouraged to use your notes from previous classes as a guide. The problems in this packet review key concepts that are necessary for your study of Calculus.
5. It is recommended that you work on this assignment throughout the summer, periodically reviewing the material. Waiting until the end of summer to begin this packet is strongly discouraged.
6. You may use online resources such as Khan Academy to assist you.
7. **Show all work neatly and clearly to receive full credit.**
8. You may use a graphing calculator on this project **only** as a reference source. The TI-84 plus CE is recommended. (It will be used throughout the year).

Best wishes for a happy and safe summer. I am looking forward to seeing you in September.

SHOW ALL WORK FOR FULL CREDIT!

1. Find the domain and range of  $f(x) = \frac{\sqrt{x-1}}{x-4}$ .

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

2. Let  $f(x) = \sqrt{x-2}$  and  $g(x) = x^6 + 2$ , find the following (Hint: Use the text as a guide if needed):

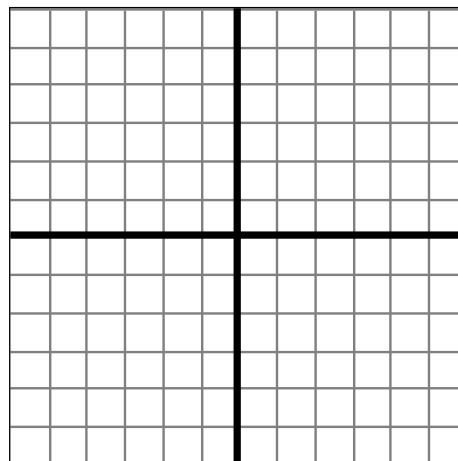
a)  $f(g(x))$

b) The domain of  $f(g(x))$

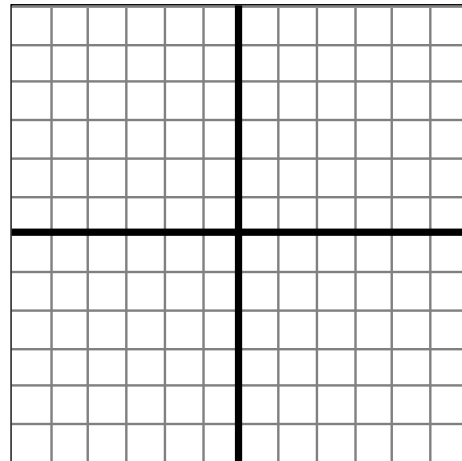
c)  $g(f(x))$

d) The domain of  $g(f(x))$

3. Sketch the graph of  $g(x) = \begin{cases} 5-3x, & x > 1 \\ 3, & x = 1 \\ 2, & x < 1 \end{cases}$



4. Sketch the graph of  $f(x) = \begin{cases} \frac{|x-3|}{x-3}, & x < 3 \\ x, & x > 3 \end{cases}$



5. One root of  $P(x) = x^3 + 2x^2 - 5x - 6$  is  $x = -1$ . Find the other roots algebraically.

6. Divide  $\frac{x^4 + 3x^2 - 1}{x^2 + 5}$  using **LONG DIVISION**.

7. A fence for a rectangular garden with one side against an existing wall is constructed by using 60 feet of fencing. What is the maximum area that can be enclosed?

8. Find exact values for the sine, cosine, tangent, cosecant and cotangent of each angle.

a)  $\frac{-5\pi}{6}$

b)  $\frac{2\pi}{3}$

$\sin \theta$ : \_\_\_\_\_

$\sin \theta$ : \_\_\_\_\_

$\cos \theta$ : \_\_\_\_\_

$\cos \theta$ : \_\_\_\_\_

$\tan \theta$ : \_\_\_\_\_

$\tan \theta$ : \_\_\_\_\_

$\csc \theta$ : \_\_\_\_\_

$\csc \theta$ : \_\_\_\_\_

$\sec \theta$ : \_\_\_\_\_

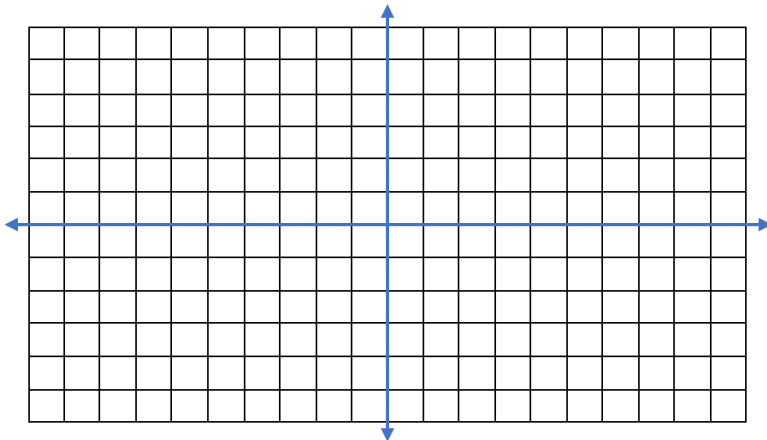
$\sec \theta$ : \_\_\_\_\_

$\cot \theta$ : \_\_\_\_\_

$\cot \theta$ : \_\_\_\_\_

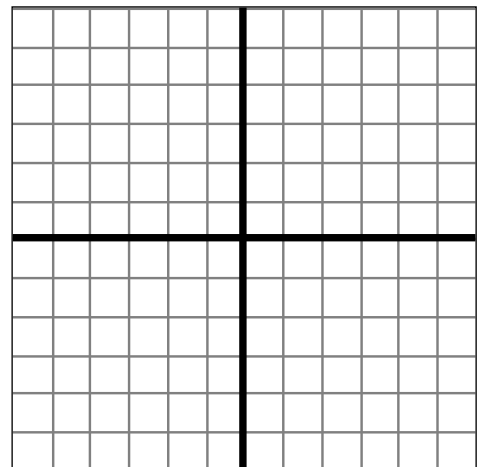
9. Evaluate  $\sin\left(\frac{7\pi}{12}\right)$  as  $\sin\left(\frac{\pi}{4} + \frac{\pi}{3}\right)$  in terms of radians.

10. Sketch the graph of  $y = -1 + 3\sin 2x$  on  $[-2\pi, 2\pi]$ . **Label** the graph carefully!!

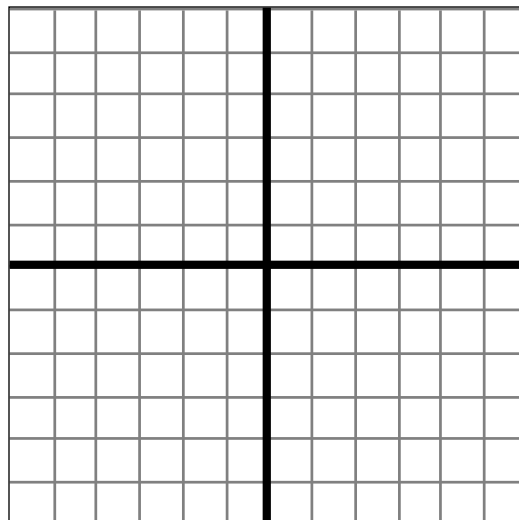


Problems 11-13 may require completing the square to write a conic section in standard form.

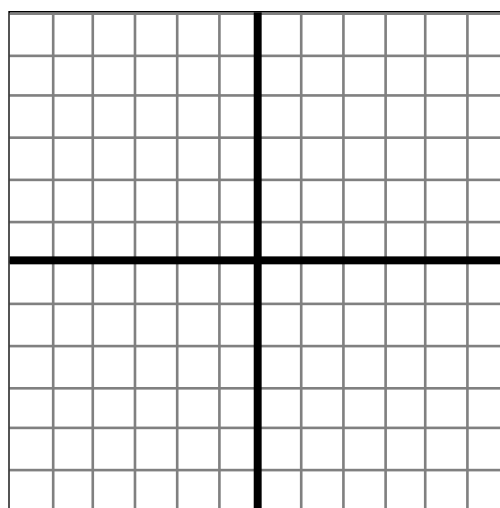
11. Write the equation  $x = y^2 + 2y + 4$  in vertex form then sketch the graph.



12. Rewrite the relation  $2x = \sqrt{8y - y^2}$  as a conic in standard form, then sketch the graph of the relation. (show all work)

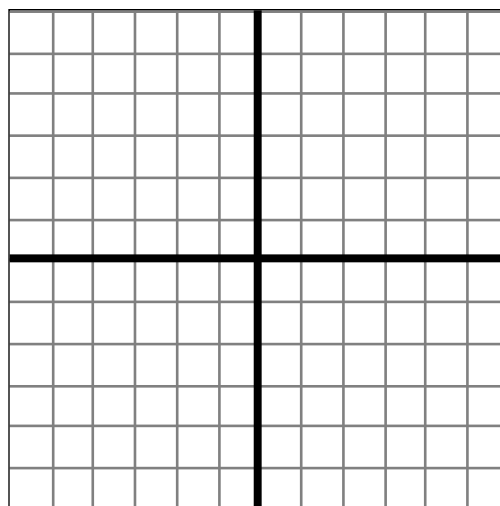


13. Rewrite the equation  $4x^2 + y^2 - 6y = 27$  in standard form and sketch its graph.



14. Let  $h(x) = (x - 2)^{\frac{1}{3}}$ .

a. Find the inverse function  $h^{-1}(x)$  using algebra: \_\_\_\_\_



b. Sketch the graphs of  $h$  and  $h^{-1}$ .

15. Solve  $\cos 2x + \sin x = 0$

16. Simplify  $\frac{(2+x)^2 - 4}{x}$

17. Simplify  $\frac{(x^2+1)(2x) - (x^2-1)(2x)}{(x^2+1)^2}$

18. Write as a sum of integer powers of  $x$ . (example:  $\frac{2}{x^2} + x$  should be written as  $2x^{-2} + x$ )

a)  $\left(\frac{x}{x^2+1}\right)^{-1}$

b)  $(x^{-1}+2)(x^{-2}+1)$

c)  $\frac{x^{-1}+x^{-2}}{x^{-3}}$

19. Simplify using properties of logs

a)  $\ln(e^{\tan x})$

b)  $\log_2(8^{x-5})$

20. Expand each expression using properties of logarithms

a)  $\log_3 15xy^4$

b)  $\ln \frac{\sqrt{2x+4}}{9}$

Evaluate each limit. Justify your answers algebraically.

21.  $\lim_{x \rightarrow 1} \frac{1-x^2}{x^2+5x-6}$

22.  $\lim_{x \rightarrow 4} \frac{x^2+9}{x^2-1}$

23.  $\lim_{x \rightarrow +\infty} \frac{x^3+2x}{3x^3+4x^2+5x}$

24.  $\lim_{x \rightarrow +\infty} \frac{\sqrt{x^2-4}}{x}$

25. For the function  $f$  graphed at the right, find the following:

a)  $\lim_{x \rightarrow 2^-} f(x) =$  \_\_\_\_\_

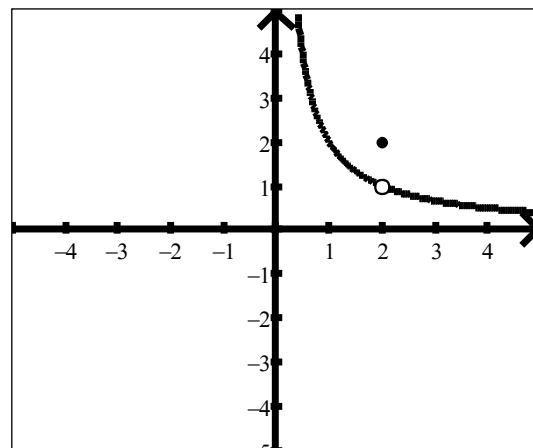
b)  $\lim_{x \rightarrow 2^+} f(x) =$  \_\_\_\_\_

c)  $\lim_{x \rightarrow 2} f(x) =$  \_\_\_\_\_

d)  $f(2) =$  \_\_\_\_\_

e)  $\lim_{x \rightarrow 0^+} f(x) =$  \_\_\_\_\_

f)  $\lim_{x \rightarrow +\infty} f(x) =$  \_\_\_\_\_



26. For the function  $g$  graphed at the right, find the following:

a)  $\lim_{x \rightarrow 1^-} g(x) =$  \_\_\_\_\_

b)  $\lim_{x \rightarrow 1^+} g(x) =$  \_\_\_\_\_

c)  $\lim_{x \rightarrow 1} g(x) =$  \_\_\_\_\_

d)  $g(-1) =$  \_\_\_\_\_

e)  $\lim_{x \rightarrow -\infty} g(x) =$  \_\_\_\_\_

