



Dear Parent(s)/Guardian(s) and Calculus Students,

Mathematics is the gateway to all college and career opportunities. As stated by the National Research Council:

“Students today are growing up in a world permeated by mathematics. The technologies used in homes, schools, and the workplace are all built on mathematical knowledge. Many educational opportunities and good jobs require high levels of mathematical expertise.”

In an effort to build a strong foundation for high school math skills and to improve student success in Calculus students are required to complete the enclosed Summer 2026 Math packet. The problems in this packet will review key math skills from previous math courses and will better prepare students for the new concepts of Calculus.

Summer Packet Guidelines:

No calculators are to be used to solve problems.

- All work must be done in pencil and shown under each problem.
- Summer packets for Calculus are due Friday September 4, 2026.
- After reviewing packets, the teachers of these classes will know which preliminary skills need to be reviewed with the students.

The teachers of the Mathematics Department are available after school for extra help. I encourage all students to take advantage of working with their own teacher so the teacher can fully assess their knowledge of mathematics.

Please feel free to email me with any concerns or questions over the summer. I will be doing day trips during the summer but will get back to you within a few days of your email. You may reach me at: pcofrancesco@notredame.org in the subject area indicate Calculus.

Peter Cofrancesco
Math Department Coordinator

SUMMER MATH PACKET

NOTRE DAME HIGH SCHOOL

CALCULUS



The examples on the following pages are to be completed and handed into your teacher on Friday, September 4, 2026. This will aid the teachers of these classes to give focus to mathematical concepts that will be necessary for this class.

Name _____

1. Determine the equation of the line passing through each pair of points in both Point-Slope Form and Slope-Intercept Form. Show all work.

a.) $(3, 9)$ and $(1, 15)$

b.) $(2, -8)$ and $(7, 2)$

2. Write the equation of the perpendicular line to each line from the previous problem in Slope-Intercept Form.

a.) $(3, 9)$ and $(1, 15)$

b.) $(2, -8)$ and $(7, 2)$

3. Factor each expression completely. Show all work.

a.) $x^3 + 12x^2 + 32x$

b.) $x^6 - 16x^4$

c.) $8x^3 + 27$

d.) $4x^3 - 8x^2 - 25x + 50$

4. Determine the roots of each polynomial expression. Show all work.

a.) $4x^3 - 20x^2 - 144x = 0$

b.) $x^3 - 9x^2 - 4x + 36 = 0$

5. Simplify each of the following expressions. Show all work.

a.) $\frac{x^3-9x}{x^2-7x+12}$

b.) $\frac{x^2-2x-8}{x^3+x^2-2x}$

c.) $\frac{\frac{1}{x}-\frac{1}{5}}{\frac{1}{x^2}-\frac{1}{25}}$

d.) $\frac{9-\frac{1}{x^2}}{3-\frac{1}{x}}$

6. Rationalize the denominator in each expression below. Show all work.

a.) $\frac{4}{1-\sqrt{5}}$

b.) $\frac{2}{\sqrt{3}+\sqrt{2}}$

7. Simplify each expression into the form ax^by^c where a , b , and c are real numbers. Show all work.

a.) $\frac{(4x^3y^5)^2}{2x^3y^2}$

b.) $(-5x^7y^8)^3$

c.) $(64x^{18}y^{12})^{-1/2}$

d.) $\sqrt[3]{(2x^9y^6)^4}$

8. Solve for x in each equation below. Express your answers in exact form (no decimals) and show all work.

a.) $5^{x-3} + 2 = 127$

b.) $3(9)^{4x} = 243$

c.) $e^{-5x} = 10$

d.) $9e^{x+5} = 72$

e.) $\log_2(x - 4) = 3$

f.) $\log_3(-6x) = \frac{1}{81}$

g.) $\ln(x) + 8 = 23$

h.) $2 \ln(x - 3) = 40$

9. Simplify each expression using properties of logarithms. Show all work.

a.) $\log(5) + \log(x^2 + 1) - \log(x - 1)$

b.) $2 \log_5(x - 3) - \log_5(x + 3)$

10. Determine the domain of each function shown below. Show all work.

a.) $f(x) = \frac{x-5}{\sqrt{x^2-x-2}}$

b.) $g(x) = \frac{5x+3}{2x-1}$

c.) $y = \sqrt{x-4}$

d.) $h(x) = \ln x$

11. Evaluate each trigonometric expression without a calculator. Rewrite each expression in terms of sine or cosine then express your final answers in exact form (no decimals).

a.) $\sin\left(\frac{\pi}{4}\right)$

b.) $\cos\left(\frac{2\pi}{3}\right)$

c.) $\tan\left(\frac{\pi}{2}\right)$

d.) $\csc\left(\frac{5\pi}{6}\right)$

e.) $\sec(\pi)$

f.) $\cot\left(\frac{3\pi}{2}\right)$

g.) $\sin\left(\frac{\pi}{6}\right)$

h.) $\sec\left(\frac{\pi}{2}\right)$

12. Solve each equation below. Express your answers in simplest radical form and show all work.

a.) $4x^2 + 12x + 3 = 0$

b.) $2x + 1 = \frac{5}{x+2}$

c.) $5x^{-2} - 45 = 0$

d.) $-4x^{\frac{3}{2}} + 36 = 4$

13. Solve the following trigonometric equations where $0 \leq x \leq 2\pi$. (Hint: Each question has at least two solutions)

a.) $\sin x = \frac{1}{2}$

b.) $2 \sin x = -1$

c.) $\cos x = \frac{\sqrt{2}}{2}$

d.) $\tan x = 0$

14. Simplify the difference quotient $\frac{f(x+h)-f(x)}{h}$ for each function below. Show all work.

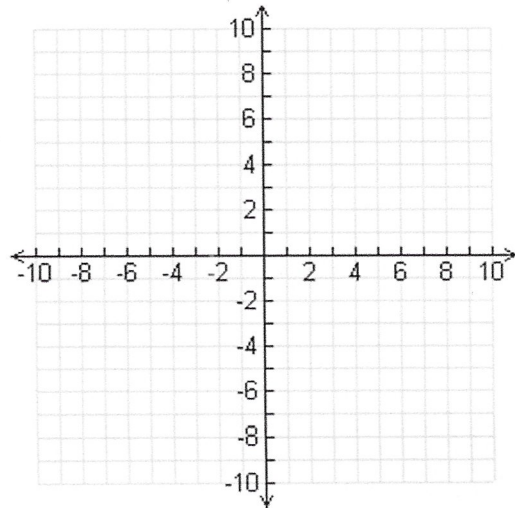
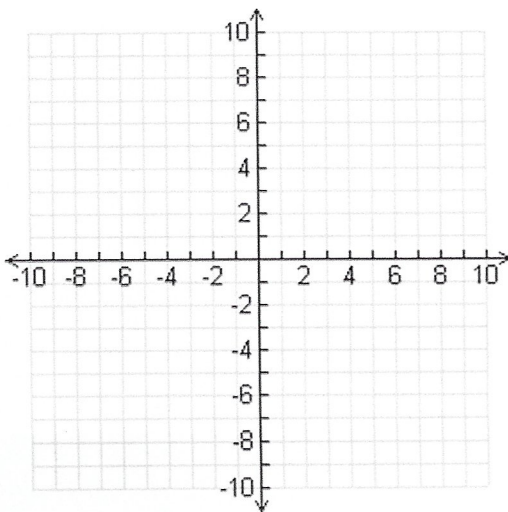
a.) $f(x) = \frac{1}{x+2}$

b.) $g(x) = x^2 + 5x$

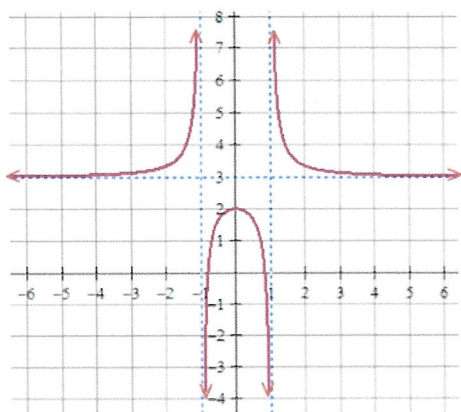
15. Determine the inverse of each function below then sketch the original function and its inverse on the provided planes. Show all work.

a.) $f(x) = \frac{3}{4}x - 6$

b.) $g(x) = 2x^3 + 8$



16. Find the domain and range of the following graphs using **interval notation**. Then, find all horizontal and vertical asymptotes.

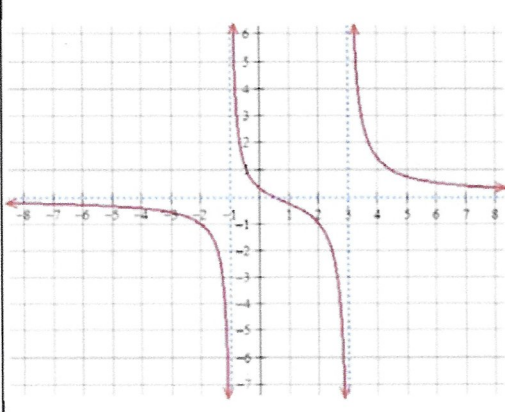


Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

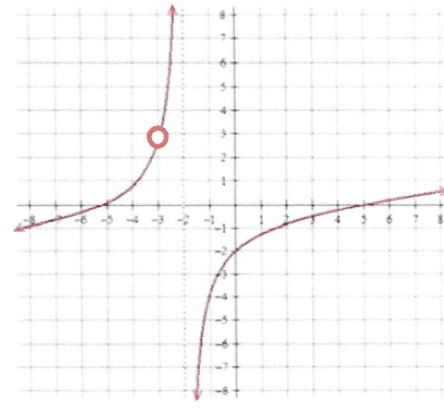


Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):



Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):