



Dear Parent(s)/Guardian(s) and IB Math 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 IB Math, 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 IB Math.

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 IB Math 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 IB Math.

Peter Cofrancesco
Math Department Coordinator

SUMMER MATH PACKET
NOTRE DAME HIGH SCHOOL
IB MATH SENIORS



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 _____

Directions: Given the following functions, find the following.

$$f(x) = 5x - 2, g(x) = 2x - 7, h(x) = 3(2 - x), k(x) = \frac{4 - x}{3}$$

a) $h(3)$

b) $k^{-1}(x)$

c) $g^{-1}(3)$

d) $h(g(6))$

Directions: Solve the following equations below. Express your answers in exact form if necessary (no decimals) and show all work.

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

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

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

d) $\log_2(x - 4) = 3$

e) $2 \ln(x - 3) = 40$

Directions: Simplify each expression using properties of logarithms. Show all work.

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

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

Directions: 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.) $h(x) = \ln x$

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

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

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

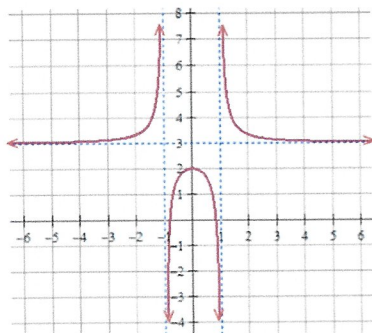
a.) $\cos 2x + \cos x = 0$

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

c.) $2 \sin^2 x - \sin x = 0$

d.) $\tan x = 0$

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

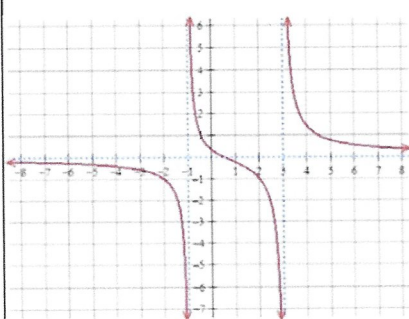


Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

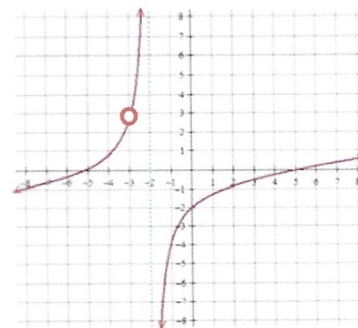


Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):



Domain:

Range:

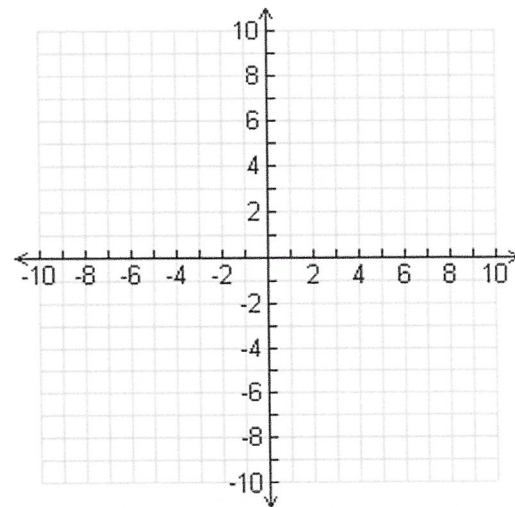
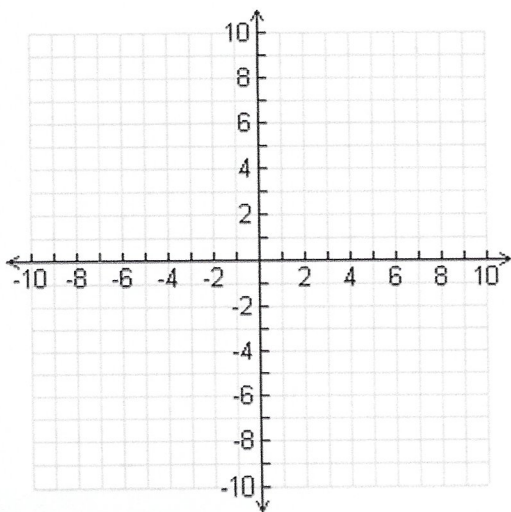
Horizontal Asymptote(s):

Vertical Asymptotes(s):

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



Directions: Find the sum of the first 20 terms of the following arithmetic sequence:

$$5, 11, 17, \dots$$

Directions: Use the binomial theorem or Pascal's Triangle to expand the following.

$$(x + 2)^4$$

Directions: Solve the following triangles when given certain criteria. I recommend drawing the triangles first before solving.

a) In triangle ABC, right-angled at C, $AB=10$, $AC=6$. Find angle B.

b) In triangle PQR, $PQ= 7$, $PR=9$, $\angle QPR=40^\circ$. Find side QR.

c) Given sides 5, 7, and angle between them as 60° , find the area.

Directions: Fill in the table below by identifying the type of transformation(s) that relate each original function to its transformed version.

Original Function	Transformed Function	Describe the Transformation(s)
$f(x) = x^2$	$f(x) = (x - 3)^2$	
$f(x) = \sqrt{x}$	$f(x) = -2\sqrt{x+1}$	
$f(x) = \sin(x)$	$f(x) = \sin\left(x - \frac{\pi}{2}\right) + 2$	
$f(x) = x $	$f(x) = 3 2x - 1$	
$f(x) = 2^x$	$f(x) = 2^{x+2} - 4$	

IB Math SL – Summer Internal Assessment Exploration

Purpose:

The goal of this assignment is to begin the process of exploring a topic of personal interest and thinking about how it might connect to mathematics. This is the foundation of your Math Internal Assessment (IA), a major part of your IB grade.

What to Submit (Due First Week of School):

- Completed **Interest Exploration Worksheet**
 - A short **Topic Proposal Paragraph** (~150 words)
 - A **Concept Mapping Table** connecting your idea to mathematical topics covered (Topics 1–3)
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Part 1: Personal Interest Brainstorm

List at least 5 things you're interested in. These could be hobbies, sports, fields of study, news topics, artistic areas, games, or real-world issues.

Interest

Example: Baseball

Why it's interesting to you

I've played since I was young and love the strategy involved.



Part 2: Research Ideas for IA Topics

Choose 2–3 of your interests from above and do light research into possible questions or problems that could be explored mathematically.

Interest Area	Real-World Context	Possible Math Involved (even basic)
Baseball	Bat speed vs. home runs	Quadratic modeling, correlation
Music	Frequency of notes	Exponential/logarithmic functions



Part 3: Topic Proposal Paragraph

Write a paragraph describing the IA idea you find most interesting. Address the following:

- What is your topic?
- Why are you interested in it?
- What math might be used to explore it?
- What kind of data or mathematical investigation could be done?

Part 4: Concept Mapping Table

Review Topics 1, 2, and 3 and make connections between your IA idea and specific mathematical tools or techniques we've studied.

IA Idea	Related Math Concept	Description of Connection
Analyzing speeding ticket patterns	Exponential functions	Model increase in fines over time
Designing a skatepark	Geometry/trigonometry	Optimize ramp angles and safety

Suggested Math Concepts from Topics 1–3:

- **Topic 1: Number & Algebra** – sequences, series, exponential growth/decay, logarithms, binomial expansion
- **Topic 2: Functions** – function modeling, transformations, inverses, piecewise functions
- **Topic 3: Geometry & Trigonometry** – angle measures, sine/cosine rules, area, surface area/volume, radians

NOTE FOR THIS ASSIGNMENT: I will allow you to use AI resources, such as ChatGPT, to help you brainstorm and gather preliminary topics and conceptual connections. *Once we start working on the papers directly, use of those programs is strictly prohibited.*