AP Calculus AB Summer Assignment 2025-2026

Dear future AP Calculus student,

Welcome to AP Calculus AB! My name is Mrs. Brison, and I am so excited to be your AP Calculus teacher next year. You are receiving this letter because you are on the AP Calculus AB roster for the 2025-2026 school year. Calculus is the culmination of all of your years of mathematics taken prior to this point- we get to see how algebra, trigonometry, geometry, and pre-calculus come together to study the mathematics of change. Calculus is a great class for critical thinking, problem solving, and answering the questions you may have had in previous years- "when will we ever use this?" Additionally, this course is meant to prepare you to take the AP Calculus AB exam in May 2026, which can potentially qualify you for one semester of college credit.

The textbook/workbook we use in class is from flippedmath.com. We will use this workbook as a jumping off point and I will supplement from other sources as well to see a variety of problems throughout the year. The workbook is ordered through the school and is part of your school fees. You will receive the workbook on the first day of school. We will also be using a graphing calculator in class so please make sure you have a working TI-84 graphing calculator prior to the start of the school year. If you have any questions about calculators, let me know.

Please note that AP Calculus AB is a college level course. I ask that you use class time effectively to learn and practice problems. The course is fast-paced, so in order to do your best it is extremely important to keep up with daily assignments. **You should expect to work on calculus outside of class every day.** In addition to the daily assignment, resources will be available to for extra practice. The expectation is that you practice until you are proficient with the material, and this may look different for every student.

In order to give you a head start in the understanding of calculus, I want to make sure that you are coming into the class with the necessary skills that have been taught in previous classes. The summer assignment is intended to reinforce important algebra and pre-calculus skills. These are the skills that will "pop up" throughout the year as we learn the new calculus concepts, and you will be expected to remember them. It is very important that you have a strong foundation so you can focus on learning the calculus and not be bogged down by the fundamentals. At the end of the assignment there are a few introductory calculus concepts with which we will begin the year.

Please submit pictures of your assignment to Schoology by your class time on August 20, 2025 (first day of school) for a completion grade. I will collect the assignment and grade it on accuracy on August 21, 2025, so we will spend the first day of school clarifying any questions you may have. Please make sure that you show appropriate work for each problem and do not leave any questions blank. There will be a test over the summer work after the first several days of school (exact date to be shared later).

If you need assistance on the assignment, feel free to work with friends or classmates and use your resources. You can also contact me via Schoology message or email me at jbrison@granvilleschools.org. I look forward to a great year with you!

Mrs. Brison

Mrs. Brison

Name_____

The following formulas and identities will help you complete this packet. You are expected to know ALL of these for the course.

LINES

Slope-intercept: $y = mx + b$

Point-slope: $y - y_1 = m(x - x_1)$

Standard: $Ax + By = C$

Horizontal line: $y = b$ (slope = 0)

Vertical line: $x = a$ (slope = undefined)

Parallel → same slope

Perpendicular → opposite reciprocal slopes

QUADRATICS

Standard: $y = ax^2 + bx + c$

Vertex: $y = a(x - h)^2 + k$

Intercept: $y = a(x - p)(x - q)$

Parabola opens: up if $a > 0$
down if $a < 0$

Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

EXPONENTIAL PROPERTIES

$x^a \cdot x^b = x^{a+b}$ $\quad (xy)^a = x^a y^a$

$\frac{x^a}{x^b} = x^{a-b}$ $\quad \sqrt[n]{x^m} = x^{m/n}$

$x^0 = 1\ (x \neq 0)$ $\quad \left(\frac{x}{y}\right)^a = \frac{x^a}{x^b}$

$x^{-n} = \frac{1}{x^n}$

In general, it is fine to have negative exponents in your answers!

LOGARITHMS

$y = \log_a x$ is equivalent to $a^y = x$

$\log_b(mn) = \log_b m + \log_b n$

$\log_b\left(\frac{m}{n}\right) = \log_b m - \log_b n$

$\log_b(m^p) = p \log_b m$

$\ln e = 1$ $\quad \ln 1 = 0$

TRIGONOMETRIC IDENTITIES

$\csc x = \frac{1}{\sin x}$ $\quad \sec x = \frac{1}{\cos x}$ $\quad \cot x = \frac{1}{\tan x}$ $\quad \tan x = \frac{\sin x}{\cos x}$ $\quad \cot x = \frac{\cos x}{\sin x}$

$\sin^2 x + \cos^2 x = 1$ $\quad \tan^2 x + 1 = \sec^2 x$ $\quad 1 + \cot^2 x = \csc^2 x$

$\sin(2x) = 2 \sin x \cos x$ $\quad \cos(2x) = \cos^2 x - \sin^2 x$ **or** $1 - 2\sin^2 x$ **or** $2\cos^2 x - 1$

Draw the general shape of each parent function below and state the domain and range of each.

Linear: $y = x$ Domain: Range:	Quadratic: $y = x^2$ Domain: Range:
Odd-degree polynomials: (x^n for odd n) Domain: Range:	Even-degree polynomials: (x^n for even n) Domain: Range:
Exponential functions: ($y = e^x$ or $y = a^x$) Domain: Range:	Logarithmic functions: ($y = \ln x$ or $y = \log_a x$) Domain: Range:
Sine Graph $y = \sin x$ Domain: Range:	Cosine Graph $y = \cos x$ Domain: Range:
Tangent Graph $y = \tan x$ Domain: Range:	Absolute Value $y = \lvert x \rvert$ Domain: Range:
Even Root Functions $\sqrt{x}$, $\sqrt[4]{x}$, etc Domain: Range:	Odd Root Functions $\sqrt[3]{x}$, $\sqrt[5]{x}$, etc Domain: Range:

For 1-8, write an equation for each line in point-slope form.

1) Containing (4, -1) with a slope of $\frac{1}{2}$

2) containing (-6, -1) and (3, 2)

3) crossing the x-axis at $x = -3$ and y-axis at $y = 6$

4) passing through (5, -3) with an undefined slope

5) passing through (-4, 2) with a slope of 0

6) passing through (2, 8) and parallel to $y = \frac{5}{6}x - 1$

7) passing through (4, 7) and perpendicular to the y-axis

8) passing through (6, -7) and perpendicular to y= -2x - 5

Solve each equation for x. Some equations may have a specific value, but most will have a solution in terms of other variables. (For example, $x = \frac{a+b}{c}$ may be a solution).

9) $x^2 + 3x = 8x - 6$

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

11) $3xy + 6x - xz = 12$

12) $A = ax + bx$

13) $cx = vx$

14) $r = t - x(z - y)$

15) $\frac{3+x}{5-x} = 6 + y$

16) $\frac{y+2}{4-x} = 4(2 - z)$

Solve each quadratic by factoring.

17) $x^2 - 4x - 12 = 0$

18) $x^2 - 6x = -9$

19) $2x^2 - 18x + 28 = 0$

20) $3x^2 = 6x$

21) $x^2 - 36 = 0$

22) $9x^2 - 1 = 0$

23) $4x^2 + 4x + 1 = 0$

24) $12x^2 + 5x - 2 = 0$

For 25-29, evaluate the following given $f(x) = 5 - \frac{2x}{3}$ and $g(x) = \frac{1}{2}x^2 + 3x$.

25) $f(\frac{1}{2})$

26) $g(-2)$

27) $f(1) + g(0)$

28) $f(0) \cdot g(0)$

29) $\frac{g(-6)}{f(-6)}$

For 30-37, simplify each expression given $f(x) = x^2 - 1$, $g(x) = 3x$, and $h(x) = 5 - x$.

30) $f(g(x))$

31) $g(f(x))$

32) $f(f(4))$

33) $g(h(-4))$

34) $f(g(h(1)))$

35) $f(g(x-1))$

36) $g(f(x^3))$

37) $\frac{f(x+h)-f(x)}{h}$

←this has an important name in calculus!
It is called the

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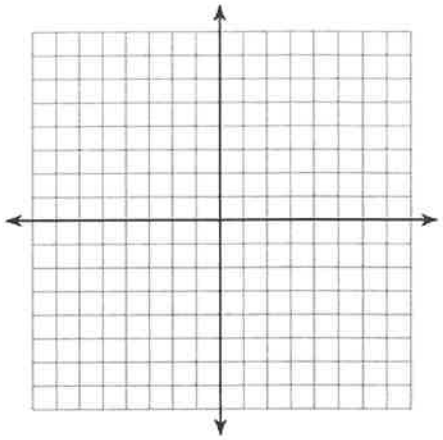
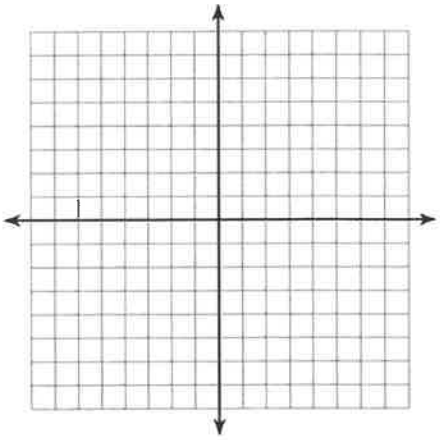
For 38-40, graph each piecewise function.

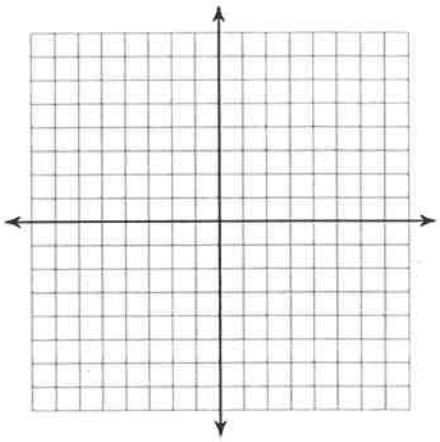
38) $f(x) = \begin{cases} x+3, & x<0 \\ -2x+5, & x \geq 0 \end{cases}$



39) $f(x) = \begin{cases} \frac{1}{2}x, & -4 \leq x \leq 2 \\ 2x-3, & x>2 \end{cases}$



40) $f(x) = \begin{cases} |x|, & x \leq 1 \\ 2-|x-2|, & x>1 \end{cases}$



For 41-45, solve each exponential equation and round answers to the nearest thousandth. Some equations can be solved by writing each side as the same base while others will require a logarithm.

41) $5^x = \frac{1}{5}$

42) $6^x = 1296$

43) $6^{2x-7} = 216$

44) $5^{3x-1} = 49$

45) $10^{x+5} = 125$

Simplify each expression without the use of a calculator. The exponential properties on page 2 of this packet will help.

46) $e^{\ln 4}$

47) $e^{2\ln 3}$

48) $\ln e^{9}$

49) $5\ln e^{3}$

Solve each exponential or logarithmic equation by hand (use of a calculator permitted for calculations). Round answers to the nearest thousandth.

50) $e^{x} = 34$

51) $3e^{x} = 120$

52) $e^{x} - 8 = 51$

53) $\ln x = 2.5$

54) $\ln(3x - 2) = 2.8$

55) $2\ln(e^{x}) = 5$

Unit Circle- Find the exact value of the expression (no decimals). These are your unit circle values, however, YOU SHOULD BE ABLE TO FIND THESE VALUES WITHOUT LOOKING AT YOUR UNIT CIRCLE.

56) $\sin\frac{2\pi}{3}$

57) $\sec\left(-\frac{5\pi}{6}\right)$

58) $\cos\frac{11\pi}{6}$

59) $\tan\frac{5\pi}{4}$

60) $\csc\frac{\pi}{4}$

61) $\cot\frac{3\pi}{4}$

62) $\sin\left(\frac{9\pi}{4}\right)$

63) $\sin\left(-\frac{2\pi}{3}\right)$

64) $\tan\frac{\pi}{3}$

65) $\sec\left(\frac{\pi}{6}\right)$

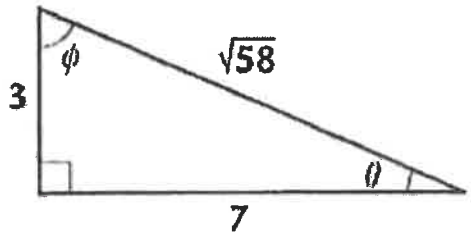
66) $\tan\frac{\pi}{6}$

67) $\tan\frac{\pi}{2}$

Evaluate each trigonometric expression using the right triangle provided. You do NOT need to rationalize the denominator.

68) $\sin\theta =$

69) $\cos\theta =$



70) $\tan\emptyset =$

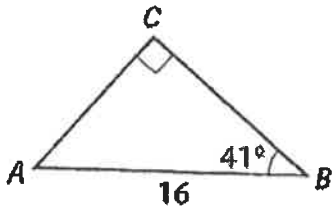
71) $\sec\emptyset =$

72) Solve the triangle (find all missing sides and angles).

$A =$ _____

$AC =$ _____

$CB =$ _____



Evaluate each inverse trigonometric function using unit circle values (no calculator). Write your answer in radians.

73) $\sin^{-1}(\frac{1}{2})$

74) $\tan^{-1}(-1)$

75) $\sin^{-1}(-1)$

76) $\cos^{-1}(-\frac{\sqrt{2}}{2})$

77) $\tan^{-1}(\sqrt{3})$

78) $\sin^{-1}(-\frac{\sqrt{3}}{2})$

79) How does the graph of $f(x)$ compare to its inverse $f^{-1}(x)$? What happens if I compose a function with its inverse (meaning what is $f(f^{-1}(x))$?)

Find the inverse of each function.

80) $g(x) = 4 - 3x$

81) $f(x) = \frac{5}{x-2}$

82) $h(x) = \sqrt{4-x} + 1$

83) If the graph of $f(x)$ has the point (2, 7), then what is one point on the graph of $f^{-1}(x)$?

Write each inequality in interval notation. For example, $x > 3$ becomes $(3, \infty)$.

84) $1 < x \leq 10$

85) $x < 0$ or $x \geq 4$

86) $x \geq -2$

Find the domain and range of each function. Write your answers in interval notation. (The graphs of the parent functions from earlier in this packet will be helpful for most problems). You can check your answers on your calculator.

87) $f(x) = \sqrt{x+5}$

88) $f(x) = (x-1)^2 + 5$

89) $f(x) = x^3 - 2x^2 - 5x + 1$

90) $f(x) = 2e^{3x} - 1$

91) $f(x) = 3\sin x - 2$

92) $f(x) = \sqrt[3]{x-1} + 2$

93) $f(x) = \sqrt{4 - x^2}$

94) $f(x) = \sqrt{16 - x^2}$

EXPONENTS

Evaluate each expression by hand. (No calculator).

95) $8^{2/3}$

96) $16^{-1/2}$

97) 4^{-2}

Rewrite the following using rational exponents. Example: $\frac{1}{\sqrt[3]{x^2}} = x^{-2/3}$

98) $\sqrt[5]{x^3} + \sqrt[5]{2x}$

99) $\sqrt{x+1}$

100) $\frac{1}{\sqrt{x+1}}$

101) $\frac{1}{\sqrt{x}} - \frac{2}{x}$

102) $\frac{1}{4x^3} + \frac{1}{2}\sqrt[4]{x^3}$

103) $\frac{1}{4\sqrt{x}} - 2\sqrt{x+1}$

Write each expression in radical form and positive exponents. Example: $x^{-2/3} + x^{-2} = \frac{1}{\sqrt[3]{x^2}} + \frac{1}{x^2}$

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

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

106) $3x^{-\frac{1}{2}}$

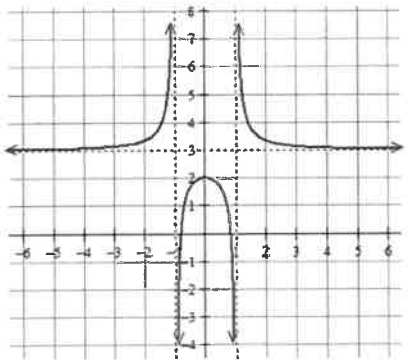
107) $(x+4)^{-1/3}$

108) $x^{-2} + x^{1/2}$

109) $2x^{-2} + \frac{3}{2}x^{-1}$

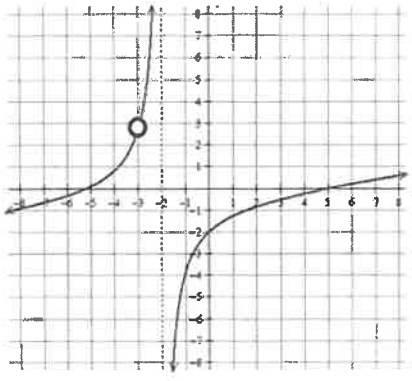
Find the domain and range and express your answers in interval notation. Find all horizontal and vertical asymptotes.

110)



Domain:
Range:
Vertical asymptotes:
Horizontal asymptotes:

111)



Domain:
Range:
Vertical asymptotes:
Horizontal asymptotes:

112) Find the vertical asymptotes, horizontal asymptotes, and any holes for the following functions.

a) $f(x) = \frac{x+5}{x^2-4}$

b) $f(x) = \frac{x^2-16}{x-4}$

c) $f(x) = \frac{x^2-5x+6}{x^2-4}$

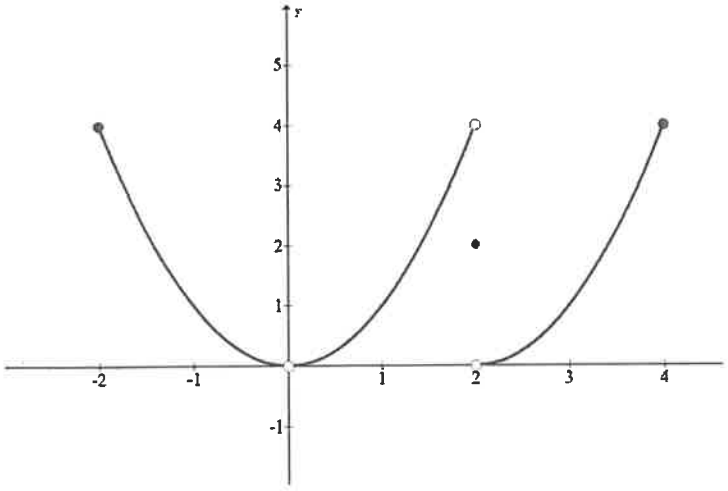
d) $f(x) = \frac{4x}{x+1}$

e) $f(x) = \frac{2x^2-6x-20}{x^3-2x^2-15x}$

113) Given $f(x) = 2x^3 - 4x^2 + 1$, use your graphing calculator to find the relative maximum and minimum of $f(x)$. Then state when the function is increasing or decreasing (write your answer in interval notation).

LIMITS

114) Use the graph of the function to answer the following questions.



a. $f(2) =$ _____

b. $\lim_{x \to 2^+} f(x) =$ _____

c. $\lim_{x \to 2^-} f(x) =$ _____

d. $\lim_{x \to 2} f(x) =$ _____

e. $f(0) =$ _____

f. $\lim_{x \to 0} f(x) =$ _____

Limits at infinity: Evaluate each limit.

115) $\lim_{x\to\infty} \frac{3x^3+5x^2-7x}{8x^3-13}$

116) $\lim_{x\to\infty} \frac{4-x}{x^2-3}$

117) $\lim_{x\to\infty} \frac{6+x-2x^2}{x^2-1}$

118) $\lim_{x\to\infty} \frac{x+4}{3}$

Log Rules

119) Evaluate: $\log_8 \frac{1}{2}$

120) Expand: $\log \frac{x^2y}{\sqrt{z}}$

121) Condense: $3\log_2 x + \frac{1}{3}\log_2 y - \log_2 z$

Miscellaneous Factoring: Factor completely.

122) $x^3 - 1$

123) $27x^3 + 8$

124) $2(x-4)^2 + 3(x-4)$

125) $3(x+2)^3 + 4x(x+2)^2$

Solving Trigonometric Equations

Solve each equation $[0,2\pi]$.

126) $2\sin x = \sqrt{2}$

127) $\sin x = \frac{1}{2}$

128) $\sin(2x) = \frac{1}{2}$