



**AP Calculus AB  
Summer Assignment  
School Year 2019-2020**

Objective of the summer assignment:

The AP Calculus summer assignment is designed to serve as a review for many of the prerequisite math skills required to be successful in the course. The goal is not only completion of the packet but also 100% mastery of the skills it contains.

Resources/Materials necessary for the summer assignment:

Notes from past math courses, other students, the internet, emailing Ms. Varanavage.

Estimated length of time to complete: 6 hours

Grade:

- This packet is a 100 point homework/classwork assignment (graded for accuracy).
- It will make up no more than 10% of your total first quarter grade (depending on other assignments).
- Three follow up quizzes will be given during the first quarter and will be worth a combined 15% of your first quarter grade.
- 5 point deduction for each **day** (not class) late.
- 3 point deduction for pages being out of order. (Look at the page numbers on the bottom.)

Due Date: No later than the 3<sup>rd</sup> day of class

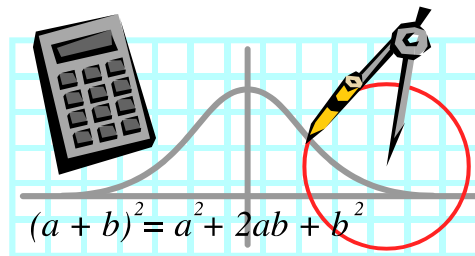
Date of assessment: Check your assignment sheet on the first day of class

Questions? Contact Ms. Varanavage [javaranavage@fcps.edu](mailto:javaranavage@fcps.edu)

# AP Calculus AB

## Summer Packet

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Dear AP Calculus AB Student:

Your AP Calculus Exam is scheduled for Tuesday, May 5<sup>th</sup> 2020. Yes, that seems like a long ways off but May rolls around faster than you think. With so much Calculus to learn prior to this date, we do not have the luxury of spending the first quarter of the school year reviewing the prerequisite topics. This summer packet has been designed and provided to help you stay “fresh” on the essential knowledge to get us started quickly. The Summer Packet is comprised of a review of essential skills from Algebra 1, Geometry, Algebra 2, and PreCalculus. You are expected to have completed the summer packet in its entirety by the first day of class as we start learning on the first day of class. It will be collected and assigned a grade. Three quizzes during the first quarter will be given to demonstrate that you have mastered these required concepts.

You are encouraged to search the web for assistance and collaborate with your future Calculus AB classmates. Remember, this packet is meant to help you refresh the topics and skills that you will need to call upon on a daily basis as we learn and perform Calculus. It would be best to start this packet no earlier than August so the topics will be fresh in your mind when we start class in the fall. Do not wait until the night before school starts – this packet takes time. Should you have any questions, please feel free to contact Ms. Varanavage at the e-mail address below. Have fun and see you next year.

Ms. Varanavage  
javaranavage@fcps.edu

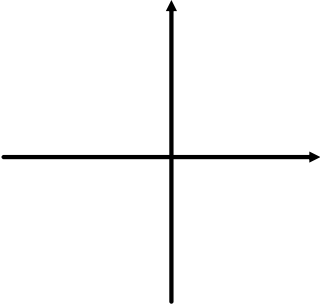
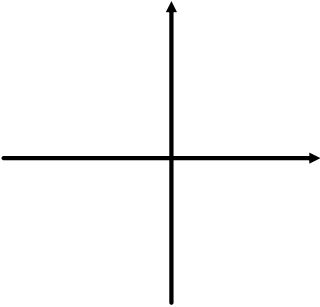
Name \_\_\_\_\_

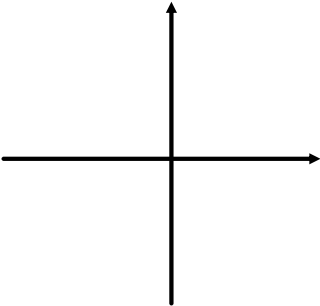
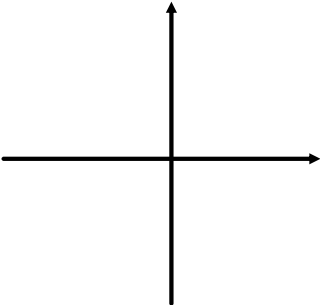
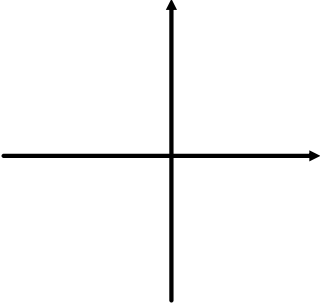
**Parent Function:** A function that does not have any translations or stretches.

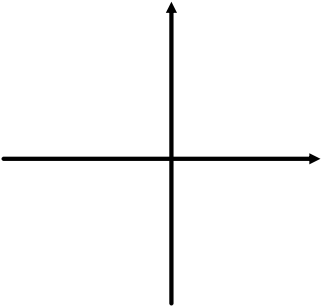
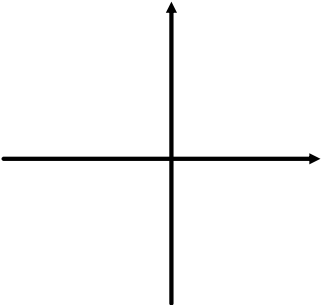
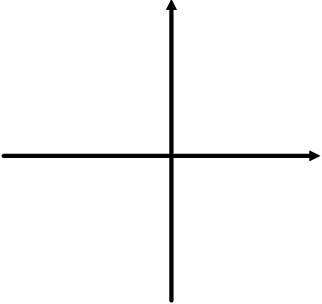
**While you may use your calculator to complete the table below, you will be responsible for knowing the characteristics of all of the parent functions included in this packet quickly and effortlessly during your year in calculus without the assistance of a graphing calculator.**

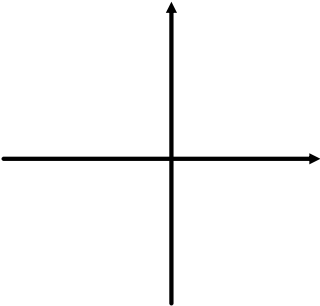
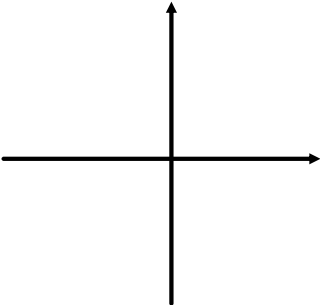
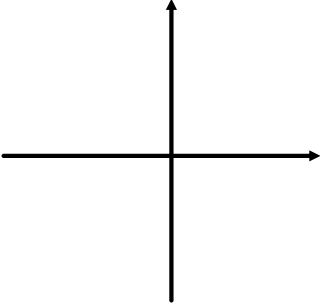
For each parent function:

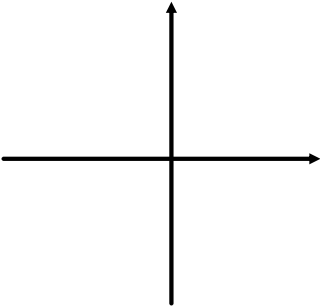
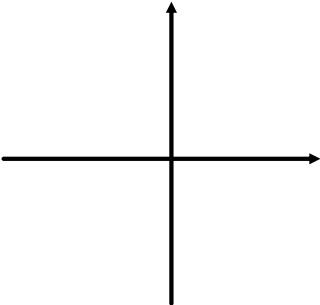
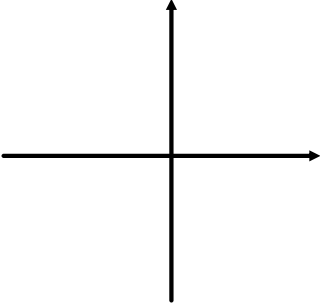
1. Graph the function
2. State the domain and range
3. Determine if there is any symmetry (**origin, x-axis or y-axis**)
4. Determine if the function is odd, even or neither
5. Write the **equation** of any asymptotes

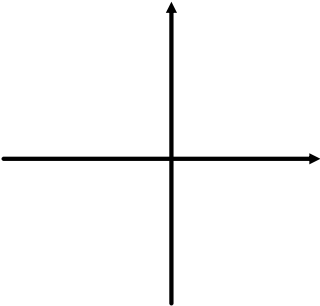
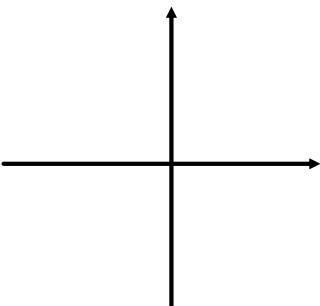
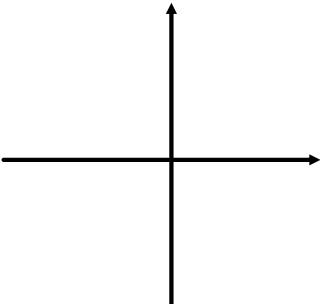
Function Type	Equation	Graph	Characteristics of f(x)
<b>Constant</b>	$f(x) = a$ <p>(where <math>a</math> is a constant for example: <math>f(x) = 1</math> or <math>y = 1</math>)</p>		Domain _____ Range _____ Symmetry _____ Even/Odd/Neither _____ Asymptotes _____
<b>Linear</b>	$f(x) = x$		Domain _____ Range _____ Symmetry _____ Even/Odd/Neither _____ Asymptotes _____

Function Type	Equation	Graph	Characteristics of f(x)
<b>Quadratic</b>	$f(x) = x^2$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Cubic</b>	$f(x) = x^3$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Absolute Value</b>	$f(x) =  x $ Or $f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.

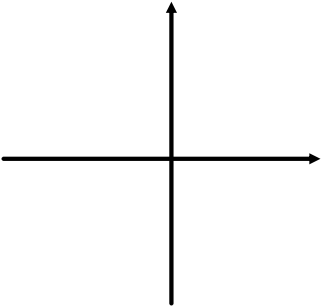
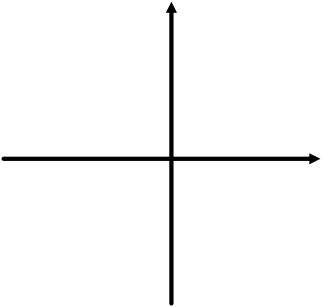
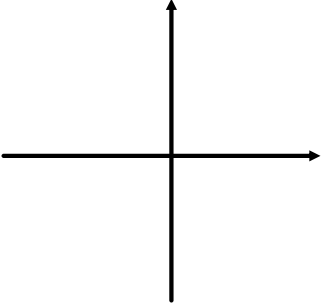
Function Type	Equation	Graph	Characteristics of f(x)
<b>Greatest Integer</b>	$f(x) = x$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Square Root</b>	$f(x) = \sqrt{x}$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Cube Root</b>	$f(x) = \sqrt[3]{x}$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.

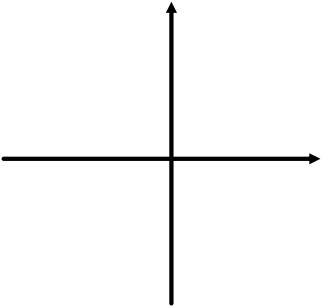
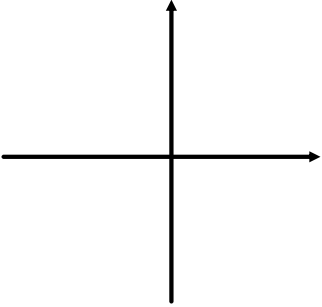
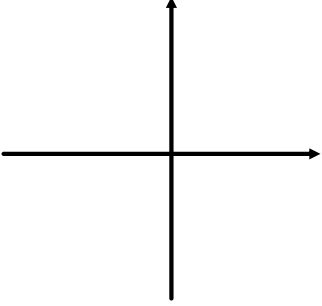
Function Type	Equation	Graph	Characteristics of f(x)
<b>Reciprocal</b>	$f(x) = \frac{1}{x}$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Squared Reciprocal</b>	$f(x) = \frac{1}{x^2}$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Exponential</b>	$f(x) = a^x$ (where $a$ is a constant for example: $f(x) = 3^x$ )		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.

Function Type	Equation	Graph	Characteristics of f(x)
<p><b>Natural Exponential</b></p>	$f(x) = e^x$ <p>(where e is the irrational number 2.71828....)</p>		<p>Domain_____.</p> <p>Range_____.</p> <p>Symmetry_____.</p> <p>Even/Odd/Neither_____.</p> <p>Asymptotes_____.</p>
<p><b>Logarithmic</b></p>	$f(x) = \log_a x$ <p>(where a is a constant for example: <math>f(x) = \log_5 x</math>)</p>		<p>Domain_____.</p> <p>Range_____.</p> <p>Symmetry_____.</p> <p>Even/Odd/Neither_____.</p> <p>Asymptotes_____.</p>
<p><b>Natural Logarithmic</b></p>	$f(x) = \ln x$		<p>Domain_____.</p> <p>Range_____.</p> <p>Symmetry_____.</p> <p>Even/Odd/Neither_____.</p> <p>Asymptotes_____.</p>

Function Type	Equation	Graph	Characteristics of $f(x)$
<b>Sine</b>	$f(x) = \sin x$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Cosine</b>	$f(x) = \cos x$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Tangent</b>	$f(x) = \tan x$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.



Function Type	Equation	Graph	Characteristics of $f(x)$
<b>Cotangent</b>	$f(x) = \cot x$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Secant</b>	$f(x) = \sec x$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Cosecant</b>	$f(x) = \csc x$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.

Function Type	Equation	Graph	Characteristics of f(x)
<b>Circle</b>	$x^2 + y^2 = 1$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Semicircle</b>	$y = \sqrt{1 - x^2}$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.
<b>Special Absolute Value</b>	$y = \frac{ x }{x}$		Domain_____. Range_____. Symmetry_____. Even/Odd/Neither_____. Asymptotes_____.

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## Graphing Calculator NOT Permitted

### Task #2 - The Algebra of Functions – Absolute Value as Piecewise Functions

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Write each absolute value function as a **piecewise function**.

1.  $y = |x - 4|$

2.  $y = |9 - x^2|$

3.  $y = |x^2 - x - 2|$

4.  $y = |2x^2 - 3x + 6|$

### Task #3 - The Algebra of Functions – Properties

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Match each expression on the right with each equivalent expression on the left. You may choose more than one that matches and you may use them more than once.

\_\_\_ 1.  $\log a + \log b$

A.  $\log b^a$

B.  $\log \frac{a}{b}$

\_\_\_ 2.  $\log a - \log b$

C.  $(x^2 + a^2)$

D.  $\log ab$

\_\_\_ 3.  $\ln e$

E.  $(x^3 + a^3)$

F.  $(x+a)(x+a)$

\_\_\_ 4.  $(x+a)^2$

G. undefined

H.  $x^3 + 3ax^2 + 3a^2x + a^3$

\_\_\_ 5.  $\log 0$

I. 1

J. 0

\_\_\_ 6.  $(x+a)^3$

\_\_\_ 7.  $e^0$

\_\_\_ 8.  $a \log b$

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# Graphing Calculator NOT Permitted

## Calculus AB

### Task #4 - The Algebra of Functions – Solving Functions

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Solve each function using **algebraic techniques** such as but not limited to factoring, cross-multiplying and inverse operations without the use of a graphing calculator. You must show the algebraic steps that support the solution to each equation. You may **NOT** use a graphing calculator to solve.

1.  $x^2 - 26x + 25 = 0$

2.  $6x^2 - x - 12 = 0$

3.  $x^2 + x = 6$

4.  $\frac{2}{x-1} = 6$

5.  $\frac{1}{x-1} = \frac{x}{x^2+1}$

6.  $\sin x = \frac{1}{2}$  for  $0 \leq x < 2\pi$

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## Graphing Calculator NOT Permitted

Solve each equation using algebraic techniques NOT a graphing calculator

7.  $\cos x = -1$  for  $0 \leq x < 2\pi$

8.  $\sin^2 x - 1 = 0$  for  $0 \leq x < 2\pi$

9.  $2e^{3x} = 10$

10.  $5e^x + 4 = 1$

11.  $\ln(5x) = 3$

12.  $\ln(2x) + 6 = 14$

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# Graphing Calculator Permitted

## Calculus AB

### Task #5 - The Algebra of Functions - Information from Graphs of Functions

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For each function, identify **A) Domain**, **B) Range**, **C) x-intercepts** and **D) y-intercepts**.

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

A) Domain (input of $f(x)$ )	B) Range (output of $f(x)$ )	C) x-intercepts (what is the value of $x$ when $y=0$ ?)	D) y-intercepts (what is the value of $y$ when $x=0$ ?)

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

A) Domain (input of $f(x)$ )	B) Range (output of $f(x)$ )	C) x-intercepts (what is the value of $x$ when $y=0$ ?)	D) y-intercepts (what is the value of $y$ when $x=0$ ?)

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3.  $f(x) = \frac{x^3}{x^2-3}$

A) Domain (input of $f(x)$ )	B) Range (output of $f(x)$ )	C) x-intercepts (what is the value of $x$ when $y=0$ ?)	D) y-intercepts (what is the value of $y$ when $x=0$ ?)

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## Graphing Calculator Permitted

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4.  $f(x) = \sqrt{x-10}$

<b>A) Domain (input of f(x))</b>	<b>B) Range (output of f(x))</b>	<b>C) x-intercepts (what is the value of x when y=0?)</b>	<b>D) y-intercepts (what is the value of y when x=0?)</b>

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5.  $f(x) = \ln(x+2)$

<b>A) Domain (input of f(x))</b>	<b>B) Range (output of f(x))</b>	<b>C) x-intercepts (what is the value of x when y=0?)</b>	<b>D) y-intercepts (what is the value of y when x=0?)</b>

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6.  $f(x) = \ln(x^2)$

<b>A) Domain (input of f(x))</b>	<b>B) Range (output of f(x))</b>	<b>C) x-intercepts (what is the value of x when y=0?)</b>	<b>D) y-intercepts (what is the value of y when x=0?)</b>

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## Graphing Calculator Permitted

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7.  $f(x) = e^x + 3$

A) Domain (input of $f(x)$ )	B) Range (output of $f(x)$ )	C) x-intercepts (what is the value of $x$ when $y=0$ ?)	D) y-intercepts (what is the value of $y$ when $x=0$ ?)

8.  $f(x) = e^{-x} + 3$

A) Domain (input of $f(x)$ )	B) Range (output of $f(x)$ )	C) x-intercepts (what is the value of $x$ when $y=0$ ?)	D) y-intercepts (what is the value of $y$ when $x=0$ ?)

9.  $f(x) = xe^x$

A) Domain (input of $f(x)$ )	B) Range (output of $f(x)$ )	C) x-intercepts (what is the value of $x$ when $y=0$ ?)	D) y-intercepts (what is the value of $y$ when $x=0$ ?)

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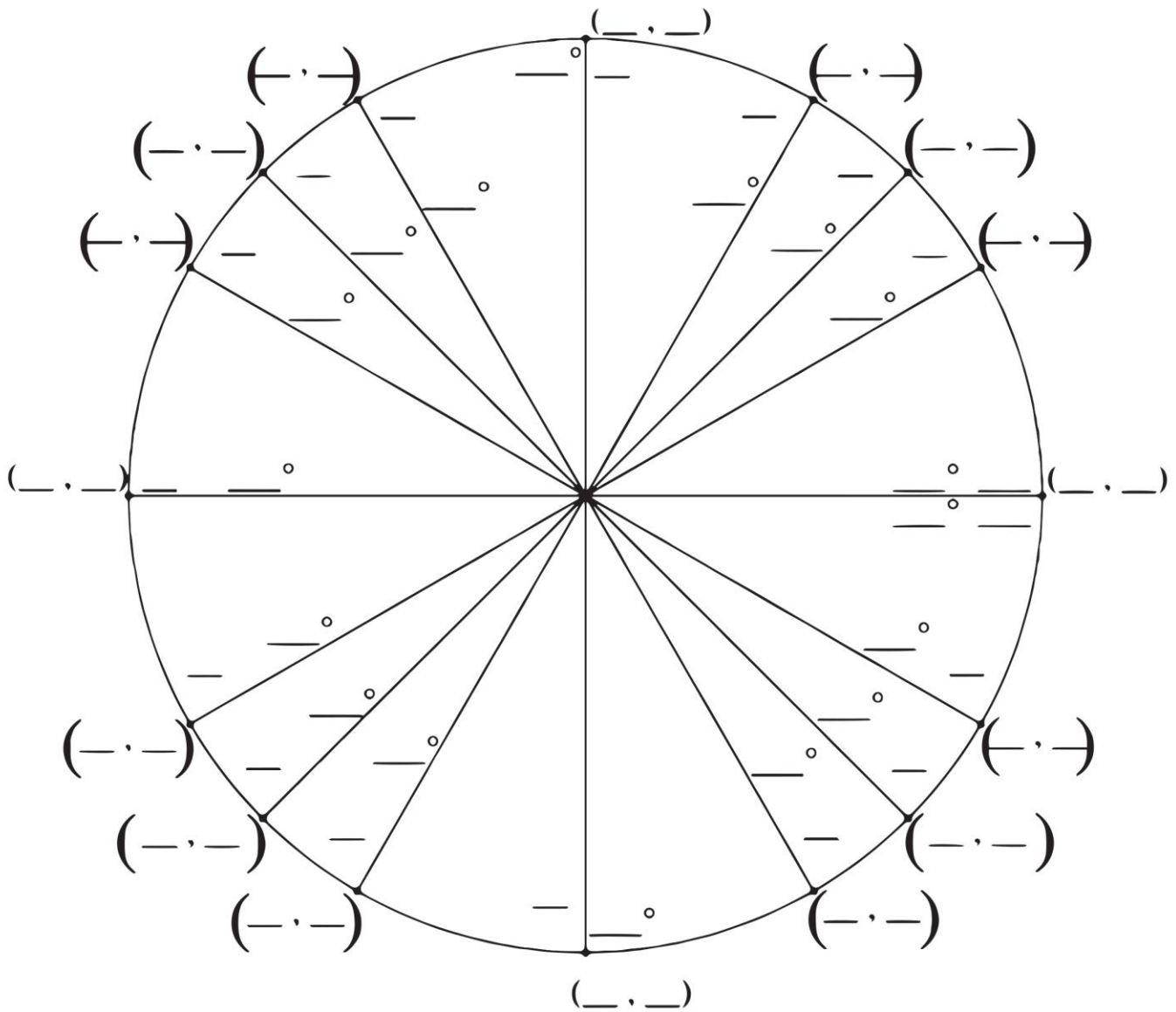
# Graphing Calculator NOT Permitted

Calculus AB

Task #6 - The Algebra of Functions – Trigonometry Unit Circle

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Fill in the values on the Unit Circle below.



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# Graphing Calculator NOT Permitted

## Calculus AB

### Task #7 – Limits and Continuity

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Evaluate each limit without a calculator.

1.  $\lim_{x \rightarrow 5} \frac{x^2 - x + 10}{x - 5}$

2.  $\lim_{x \rightarrow 9} \frac{9 - x}{\sqrt{x} - 3}$

3.  $\lim_{x \rightarrow 0} \frac{5x + x^2}{x}$

4.  $\lim_{x \rightarrow -4} \frac{x^3 + 64}{x + 4}$

5.  $\lim_{x \rightarrow 2} \frac{x^4 - 2x^3 - 4x + 8}{x - 2}$

6.  $\lim_{h \rightarrow 0} \frac{(3h+1)^2 - 1}{h}$

7.  $\lim_{x \rightarrow 0} \frac{\sin x}{x}$

8.  $\lim_{x \rightarrow 5} \frac{\frac{1}{x} - \frac{1}{5}}{x - 5}$

9.  $\lim_{x \rightarrow 3^+} \frac{x + 4}{x - 3}$

10.  $\lim_{x \rightarrow \infty} \frac{x^3 + 4}{x + 4}$

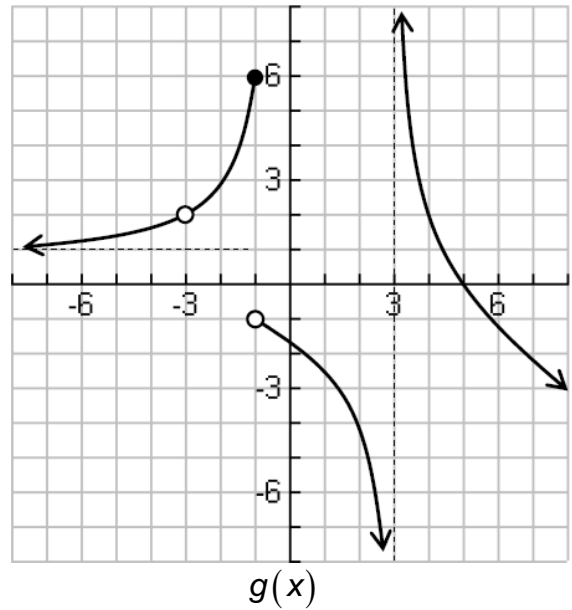
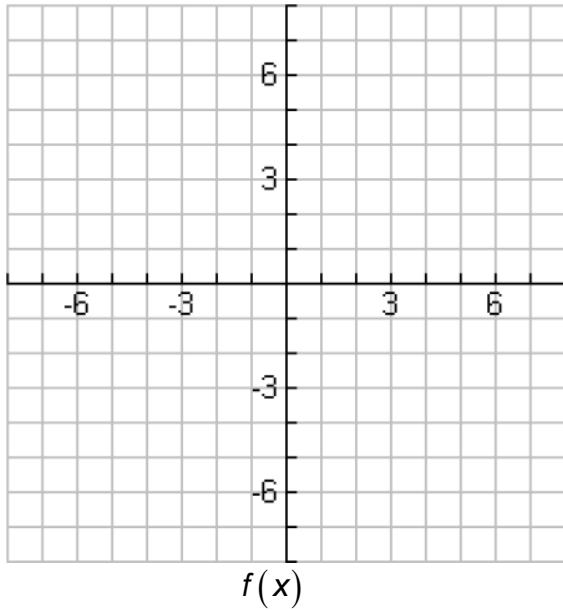
5.  $\lim_{t \rightarrow \infty} \frac{2t^2 - 1}{3t^2 + 9}$

12.  $\lim_{x \rightarrow \infty} \frac{7x}{x^3 - 1}$

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If  $f(x) = \frac{1}{x-2}$ , graph this function on the grid below.



Use the functions  $f(x)$  and  $g(x)$  to answer the questions 13 – 26.

13.  $f(2)$  \_\_\_\_\_

14.  $g(-3)$  \_\_\_\_\_

15.  $\lim_{x \rightarrow 0^+} f(x)$  \_\_\_\_\_

16.  $g(-1)$  \_\_\_\_\_

17.  $\lim_{x \rightarrow 2^-} f(x)$  \_\_\_\_\_

18.  $\lim_{x \rightarrow -1^+} g(x)$  \_\_\_\_\_

19.  $\lim_{x \rightarrow \infty} f(x)$  \_\_\_\_\_

20.  $\lim_{x \rightarrow 3^-} g(x)$  \_\_\_\_\_

21.  $\lim_{x \rightarrow 5} 4f(x)$  \_\_\_\_\_

22.  $\lim_{x \rightarrow -\infty} g(x)$  \_\_\_\_\_

23.  $\lim_{x \rightarrow 5} (g(x) - 2f(x))$  \_\_\_\_\_

24.  $\lim_{x \rightarrow 4} (g(x) + x^2)$  \_\_\_\_\_

25. State the  $x$ -values for which the limit does not exist on  $g(x)$ . \_\_\_\_\_

26. State the  $x$ -values for which  $f(x)$  is discontinuous. \_\_\_\_\_

27. State the  $x$ -values for which  $g(x)$  is discontinuous. \_\_\_\_\_

**End of assignment**