

Calculus Summer Packet

Name _____

- ❖ Valid & appropriate work must be shown in the packet or on separate sheets of paper attached to the packet. *If work isn't shown, you will lose points.*
- ❖ The answer for each problem must be easily found. (i.e. Circle the answer, highlight the answer make an answer column, etc.)
- ❖ Be prepared for a test on the material in this packet during the first two weeks of school in the fall semester.

Scoring*

	Tuesday, 9/4	Wednesday, 9/5	Thursday, 9/6	Friday, 9/7	Monday, 9/10 (or later)
All problems complete	100%	100%	75%	50%	0%

*Each problem is worth approximately $\frac{1}{4}$ of a point for a total of 20 ACHIEVEMENT points possible.

A. PARENT FUNCTIONS

You need to know the basic characteristics of parent functions:

- Domain
- What the general graph looks like
- End Behavior (be able to write using limit notation)

Here is a list of parent functions you need to have *memorized*:

- Linear
- Quadratic
- Cubic
- Square Root
- Absolute Value
- Rational
- Sine
- Cosine

B. COMPLEX FRACTIONS

Example:

$$\frac{\frac{-2}{x} + \frac{3x}{x-4}}{5 - \frac{1}{x-4}} = \frac{\frac{-2}{x} + \frac{3x}{x-4}}{5 - \frac{1}{x-4}} \cdot \frac{x(x-4)}{x(x-4)} = \frac{-2(x-4) + 3x(x)}{5(x)(x-4) - 1(x)} = \frac{-2x + 8 + 3x^2}{5x^2 - 20x - x} = \frac{3x^2 - 2x + 8}{5x^2 - 21x}$$

Simplify each of the following.

1. $\frac{\frac{25}{a} - a}{5+a}$

2. $\frac{2 - \frac{4}{x+2}}{5 + \frac{10}{x+2}}$

3. $\frac{4 - \frac{12}{2x-3}}{5 + \frac{15}{2x-3}}$

C. EVALUATING FUNCTIONS

Let $f(x) = 2x + 1$ and $g(x) = 2x^2 - 1$. Find each.

4. $f(2) =$ _____

5. $g(-3) =$ _____

6. $f(t + 1) =$ _____

7. $f[g(-2)] =$ _____

8. $g[f(m + 2)] =$ _____

9. $\frac{f(x+h)-f(x)}{h} =$ _____

Let $f(x) = \sin x$. Find each exactly.

10. $f\left(\frac{\pi}{2}\right) =$ _____

11. $f\left(\frac{2\pi}{3}\right) =$ _____

Let $f(x) = x^2$, $g(x) = 2x + 5$, and $h(x) = x^2 - 1$. Find each.

12. $h[f(-2)] =$ _____

13. $f[g(x - 1)] =$ _____

14. $g[h(x^3)] =$ _____


Find $\frac{f(x+h)-f(x)}{h}$ for the given function f .

15. $f(x) = 9x + 3$

16. $f(x) = 5 - 2x$

D. INTERVAL NOTATION

17. Complete the table with the appropriate notation or graph.

Solution	Interval Notation	Graph
$-2 < x \leq 4$		
	$[-1, 7)$	
		

E. EQUATION OF A LINE

Slope intercept form: $y = mx + b$

Vertical line: $x = c$ (slope is undefined)

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

Horizontal line: $y = c$ (slope is 0)

18. Use slope-intercept form to find the equation of the line having a slope of 3 and a y-intercept of 5.

19. Determine the equation of a line passing through the point (5, -3) with an undefined slope.

20. Determine the equation of a line passing through the point (-4, 2) with a slope of 0.

21. Use point-slope form to find the equation of the line passing through the point (0, 5) with a slope of $2/3$.

22. Find the equation of a line passing through the points (-3, 6) and (1, 2).

23. Find the equation of a line with an x-intercept (2, 0) and a y-intercept (0, 3).

F. FINDING INTERCEPTS

Algebraically

Graphically

Zeros (x-intercepts): Set $y = 0$ or $f(x) = 0$ and solve.

Hit “2nd”, “Calc”, then “Zero”.

Y-Intercept: Set $x = 0$ and solve.

Hit “2nd”, “Calc”, then “Value”. Type “0”.

24. Find the intercepts of each function algebraically, if they exist. Verify using the graph. Write solutions as coordinate points.

a. $y = 3x - 9$

b. $f(x) = \frac{x+1}{x-3}$

c. $f(x) = 2x^2 - 9x - 5$

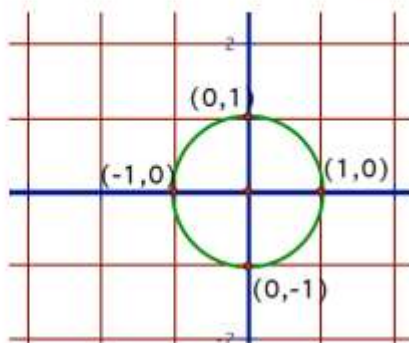
d. $y = \sqrt{x-1} + 2$

G. UNIT CIRCLE

You can determine the sine or cosine of a quadrantal angle by using the unit circle. The x-coordinate of the circle is the cosine and the y-coordinate is the sine of the angle.

Example: $\sin 90^\circ = 1$

$$\cos \frac{\pi}{2} = 0$$



25. a) $\sin \pi$

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

c) $\sin -\pi$

d) $\tan \pi$

e) $\cos 2\pi$

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

Find the exact value of the function. Do not use a calculator.

26. a) $\sin \frac{\pi}{3}$

b) $\cos \frac{3\pi}{4}$

c) $\tan \frac{5\pi}{6}$

d) $\sin -\frac{5\pi}{6}$

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

f) $\tan \frac{\pi}{4}$

g) $\sin -\frac{\pi}{4}$

h) $\cos \frac{5\pi}{3}$

i) $\tan \frac{4\pi}{3}$

H. TRIGONOMETRIC EQUATIONS

Solve each of the equations for $0 \leq x \leq 2\pi$. Find all of the solutions within the given domain. Remember to double the domain when solving for a double angle. Use trigonometric identities, if needed, to rewrite the trigonometric functions. (See the formula sheet at the beginning of the packet.)

$$27. \sin x = \frac{1}{2}$$

$$28. \cos x = -\frac{\sqrt{2}}{2}$$

$$29. \tan x = 1$$

$$30. \sin x = -1$$

$$31. \cos x = 0$$

$$32. \tan x = -\frac{\sqrt{3}}{3}$$

$$33. 2 \cos x = \sqrt{3}$$

$$34. \cos 2x = \frac{1}{\sqrt{2}}$$

$$35. \sin 2x = -\frac{\sqrt{3}}{2}$$

I. VERTICAL ASYMPTOTES

Determine the vertical asymptotes for the function. Set the denominator equal to zero to find the x-value for which the function is undefined. That will be the vertical asymptote.

$$36. f(x) = \frac{1}{x^2}$$

$$37. f(x) = \frac{x^2}{x^2-4}$$

$$38. f(x) = \frac{2+x}{x^2(1-x)}$$

J. HORIZONTAL ASYMPTOTES

Determine the horizontal asymptotes using the three cases below.

Case I. Degree of the numerator is less than the degree of the denominator. The asymptote is $y = 0$.

Case II. Degree of the numerator is the same as the degree of the denominator. The asymptote is the ratio of the lead coefficients.

Case III. Degree of the numerator is greater than the degree of the denominator. There is no horizontal asymptote. The function increases without bound. (If the degree of the numerator is exactly 1 more than the degree of the denominator, then there exists a slant asymptote, which is determined by long division.)

Determine all Horizontal Asymptotes.

$$39. f(x) = \frac{x^2-2x+1}{x^3+x-7}$$

$$40. f(x) = \frac{5x^3-2x^2+8}{4x-3x^3+5}$$

$$41. f(x) = \frac{4x^5}{x^2-7}$$

K. LOGARITHMS

Simplify each of the following:

42. $\ln 5 + \ln(x^2 - 1) - \ln(x - 1)$

43. $2 \ln 9 - \ln 3$

44. $e^{2 \ln 5}$

L. FACTORING (Know how to factor using the three techniques listed below)

Quadratic Trinomial

Difference of Perfect Squares

Greatest Common Factor (GCF)

Completely factor each of the following:

45. $f(x) = 3x^5 + x^4 - 10x^3$

46. $f(x) = 4x^6 - 9$

47. $g(x) = x^6 + 5x^3 + 6$

M. REWRITING EQUATIONS / SOLVING FOR A VARIABLE

In each of the following, solve for “y”.

48. $2 = x^2y + 6x - 3y$

49. $16x = 5x^2 - xy^2 + 3y^2$

N. SIMPLIFYING TRIGONOMETRIC EXPRESSIONS

$$\sin x = \frac{1}{\csc x}$$

$$\cos x = \frac{1}{\sec x}$$

$$\tan x = \frac{1}{\cot x}$$

$$\sin^2 x + \cos^2 x = 1$$

$$\csc x = \frac{1}{\sin x}$$

$$\sec x = \frac{1}{\cos x}$$

$$\cot x = \frac{1}{\tan x}$$

$$\tan x = \frac{\sin x}{\cos x}$$

$$\cot x = \frac{\cos x}{\sin x}$$

Simplify the expressions as much as possible.

50. $\frac{\csc x}{\sin x} - \frac{\cot x}{\tan x}$

51. $\tan x \cot x - \cos^2 x$

52. $\cos x - \cos x \sin^2 x$

O. SOLVING SYSTEMS OF EQUATIONS

Graphically

Algebraically: Substitution, Elimination

Solve the system of equations using the method described. Write all solutions as ordered pairs.

53. *Elimination*

$$-4x + 9y = 9$$

$$x - 3y = -6$$

54. *Substitution*

$$2x - 3y = -1$$

$$y = x - 1$$

55. *Graphically*

$$y = 2x - 1$$

$$y = -x^2 + 3$$

2018-2019

Course Title: *Advanced Placement Calculus*

Instructor: Jeffrey Eisenhart

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Voicemail: (248) 674 - 6108

Conference period: 4th (M, T, W, F 10:08am – 10:58am; R 9:38am – 10:18am)

Room number: 300

Course Description

This course is equivalent to the first semester of college Calculus. It includes derivatives of algebraic functions, integrals, and differential equations. Students will be trained to take the Calculus AB advanced placement exam.

Prerequisites: Successful completion of Pre-Calculus **and teacher recommendation.**

Units of Study

- Unit 1: Limits and their Properties
- Unit 2: Differentiation
- Unit 3: Integration
- Unit 4: Applications of Derivative
- Unit 5: Applications of integration
- Unit 6: Differential equations and other miscellaneous topics

Primary Resources

Calculus of a Single Variable. Seventh Edition. *Houghton Mifflin Company*, 2002.

Instruction

Welcome back to school! I can't wait to meet you and get the school year started. We will be learning the above topics through various instructional methods. These methods include direct instruction, explorations, use of technology, cooperative learning groups, and guided practice. My goal for this class is to prepare you to be as successful as possible on the AP Calculus AB test in May. However, you are **NOT** required to take the AP test. I want to help each of my students understand calculus and gain further confidence in the area of mathematics. Consequently, I am available for help every morning before school and, with the exception being Thursdays, every afternoon after school. You **MUST** be prepared to ask for help when you need it, regardless of your ability, and/or your experiences in the past.

Grading

The purpose of grading in this class is to ascertain and to communicate, fairly and accurately, the academic achievement of each student. *"Modified Grade"* will be noted on report cards for students who receive services per their current Individualized Education Program (IEP).

Grading Content

Grades will reflect assessment of individual student mastery of the course curriculum. Assessments will be based on individual achievement of established standards (criterion referenced), and not on student comparisons (norm referenced).

Grading Calculation

1. All grading will be done on a points-earned basis. This means that to calculate your grade I will divide the number of points you earned by the number of points possible to obtain a percentage. Where this percentage falls within the scale is what your letter grade will be.
2. Here is my grading scale:

93-100% = A	80-83% = B-	67-69% = D+
90-92% = A-	77-79% = C+	64-66% = D
87-89% = B+	74-76% = C	60-63% = D-
84-86% = B	70-73% = C-	59% or less = E

Grading Practices

HOMEWORK: Homework will be assigned on most nights. I **will not** check every assignment for points. This is an AP course that is designed to help you earn college credit. In the collegiate world, homework is completed because it's necessary to achieve success. Homework should be completed with the expectation of earning points. If I may use a sports analogy, no individual or team earns points practice. Victories are earned during the match, meets, and games. Our quizzes and tests serve as our "competitive" events. All homework assignments will be posted on Remind. I expect all of you to check Remind daily, especially if you are absent.

QUIZZES: All quizzes will be announced ahead of time. All quizzes will be worth 50 points. All quizzes will be grade adjusted in order to align with the grading practices of College Board and the Advanced Placement Program.

TESTS: Tests will be announced ahead of time. Tests will cover a larger number of concepts. All tests will be worth 100 points. Most tests will be in the format of the AP Calculus exam (to be discussed later) and graded accordingly.

IN-CLASS/TAKE-HOME AP OPEN RESPONSE PROBLEMS: Approximately once per week you will be assigned an open response AP problem to be completed inside

or outside of class. It will be graded in the same way that the graders score an AP problem. Each problem is worth 10 points. Most of these problems will be solved in groups.

IN CLASS AP MULTIPLE CHOICE PROBLEMS: Approximately once per week you will be given 3 AP-style multiple choice questions worth 2 points each. These multiple choice questions will be related to those topics being discussed in class at the time.

Classroom Expectations

1. Please respect yourself, each other, and all property.
2. I will not let you leave the room for irresponsible reasons. For example, I forgot this, I need to tell someone something, I need to call home and remind my dog to eat its food, etc.
3. Please do not sit on the desks.
4. Late is late. If you are not in the room when the bell has finished ringing, you will be marked tardy. I will follow the administrative procedures regarding tardiness.

5. You will need to bring something to write with, a notebook of some sort, a calculator, and your book every day. Please feel free to bring anything else you feel will help you be more successful in this class. It is my suggestion that you have 2 notebooks, one for notes and one for HW.
6. I will not set a limit on the number of bathroom passes you each will receive. However, if it becomes clear that you have a problem abusing this norm, I will be forced to take the appropriate action. Please remember that passes will not be written during the first and last ten minutes of class.
7. I will follow the Waterford School District Code of Conduct.

Final Thoughts on your Success:

1. Each of you **must** be prepared to give 100% of your effort, attention, and enthusiasm to everything we do in class. If you are not prepared to work as hard as you possibly can, quite frankly, you are in the wrong course.
2. You must be prepared to swallow your pride and ask for help as much, and as often, as you need.
3. Although the events that accompany a typical senior year are exciting and important, you cannot let these events distract you from your focus on your academics.
4. This course is going to be challenging. At times, this course will be extremely frustrating for some of you. All of you must fight through this and remember that I am on your side, and we are in this together. **I believe in all of you!** I am willing to do whatever it takes to help you understand the material. However, please remember the learning process is a two-way street.
5. If there comes a time during the year when you begin to doubt yourself and your mathematical talent please remember the following:

You are Mott's best math students, and you belong exactly where you are! Please don't give up. I will help you! You're a 5!