

To:	AP Calculus AB students
From:	The Math Department
Date:	June 9, 2017

This is the summer packet of review work that you must complete to be prepared for the AP Calculus AB course. A good reference section would be the *Chapter 1: Prerequisites for Calculus* from your textbook for the course, Calculus: Graphical, Numerical, Algebraic, Third Edition by Finney, Demana, Waits, Kennedy. If you cannot get your textbook before the start of the year, please send an email to [cbromley@theproutschool.org](mailto:cbromley@theproutschool.org) and we will see what can be done. Another very useful source are the books available through openstax.org, especially the PreCalculus and the Algebra/Trigonometry books. These are free. The handout is the packet of review problems you are to complete. Do all your work NEATLY, directly on the paper given.

### **Here is general information about the course.**

#### Requirements:

- To qualify for enrollment in AP Calculus AB, students need to successfully complete Honors Pre-Calculus or in IB Math and gain their teachers recommendation.
- Given the advanced nature of this course, it is assumed that students are not only of high ability in mathematics but are able to work independently, retain material learned, and apply concepts to various problem-solving situations.
- All students in Calculus receive a summer packet of work they will need to complete and get to their teacher by **the first day of classes**. This is a review of *prerequisite* topics the students must understand to succeed in the Calculus course.
- Students are required to take a test on the prerequisite material on **the third day of classes**. If any student fails this assessment, they may be advised to enroll in another course.
- Parents and their students will sign a “contract of commitment” outlining the policy regarding the summer work and the level of commitment needed to succeed in the AP portion of the course. This will be due on the **first day of classes**.
- All students enrolled in AP Calculus are required to take the AP test during the first week of May at a cost of approximately \$90 (2016 fee).

Don't wait until August to begin your work on the packet. Pace yourself throughout the summer months and the assignment will not seem overwhelming. You may use sources other than the materials given to review the Pre-Calculus topics and complete the packet. You may work with others on the packet, but your answers must be your own! Remember, the point of this assignment is to prepare YOU for a successful experience with AP Calculus AB.

If you have questions, you can contact the Mr. Bromley this summer: [cbromley@theproutschool.org](mailto:cbromley@theproutschool.org)

June 9, 2017

Dear Parents/Guardians,

Your son or daughter registered to take AP Calculus AB for the fall of 2017. During the second week of June, the students were given access to a summer packet of review work that must be completed to prepare them for the rigorous pace of these courses. Here is a reminder of some of the information your student received regarding the course:

Requirements:

- To qualify for AP Calculus AB, students need to have successfully completed Honors Pre-Calculus or IB Math.
- Given the advanced nature of this course, I assume that students are not only of high ability in mathematics but are able to work independently, retain material learned, and apply concepts to various problem-solving situations.
- All students in AP Calculus received a summer packet of work they will need to complete and have ready for the **first day of class**. This is a review of *prerequisite* topics that the students must understand to succeed in the course.
- Students are required to take a test on the prerequisite material on the **third day of classes**. If any student fails this assessment, they may be advised to enroll in another course.
- Parents and their students will sign a "contract of commitment" that outlines the policy regarding the summer work and the level of commitment needed to succeed in the course. Please sign and bring to class on the first day.
- All students enrolled in AP Calculus are required to take the AP test during the beginning of May at a cost of approximately \$90 (2016 fee). Note: this year, because of a conflict with the IB Biology exam, some students will be taking their AP Calculus exam later in May on a make-up day.

Based on the information regarding the start of school in the fall, the summer packet would be due on **Wednesday, August 28<sup>th</sup>** & the test will be given in class on **Friday, August 30<sup>th</sup>**. Students may use sources other than the materials given to review the Pre-Calculus topics and complete the packets. Students may work with others on the packets, but their answers must be their own! The point of this assignment is to prepare each student for a successful experience with AP Calculus.

If you have questions for me regarding the course and requirements, you can consult the College Board website <https://apstudent.collegeboard.org/apcourse> or contact me via email this summer:

Mr. Christopher Bromley

Email: [cbromley@theproutschool.org](mailto:cbromley@theproutschool.org)

## Contract of Commitment

### Advanced Placement Calculus AB Mathematics at The Prout School

- **Taking the AP Exam in May is mandatory.**

Note to seniors: AP grades are not processed in time to become a part of your Prout transcript.

- **Maintaining a steady, consistent pace on homework is required.**

Homework assignments are planned to require no more than one hour to complete; however, this assumes that you have been keeping up with daily assignments and are not having to spend homework time catching up. You will be turning in your AP Calculus Assignments (both the daily homework and additional AP format problems) and will receive grades on both. **These assignments are not accepted late.** If you miss class, but attend school on a given day (Peer Ministry retreat days included), you are responsible for finding me and turning in your work on that day. If you miss class because of an illness, it will be assumed that you will turn in the assignment on the day you return to school.

- **The course requires more active problem solving than previous mathematics courses.**

At this level of mathematics instruction, you are expected to think hard about assigned problems, often supplying your own solution, rather than a teacher-supplied strategy. Modeling your solution on previous work can help you learn to do this. We will share solutions in class and you will see that more than one method can usually be used to arrive at the answer.

- **It is the student's responsibility to reconcile Senior year conflicts with course work.**

Whenever you miss class, for ANY reason, it is up to you to make up the work promptly. Do not wait to be approached by your teachers. Specific information about class policies will be distributed the first day of classes.

**I have discussed these commitments with a parent/guardian and my guidance counselor.**

Student signature: \_\_\_\_\_

Parent/Guardian signature: \_\_\_\_\_

Date: \_\_\_\_\_

Contact information for Parent/Guardian (please print)

Best person to contact: \_\_\_\_\_

Email address: \_\_\_\_\_

Phone number: \_\_\_\_\_

**PENCIL only. please.**

1. Evaluate the sine, cosine, and tangent of each angle without using a calculator (exact values only).

$\theta$	$\sin \theta$	$\cos \theta$	$\tan \theta$
$150^\circ$			
$-135^\circ$			
$\frac{7\pi}{4}$			
$\frac{11\pi}{3}$			
$180^\circ$			
$\frac{7\pi}{6}$			
$-2\pi$			
$5\pi$			

2. Find two solutions of each equation with  $0 \leq \theta < 2\pi$ . Do not use a calculator.

a)  $\sin \theta = -\frac{\sqrt{2}}{2}$

b)  $\cos \theta = \frac{\sqrt{3}}{2}$

c)  $\cot \theta = \frac{-\sqrt{3}}{3}$

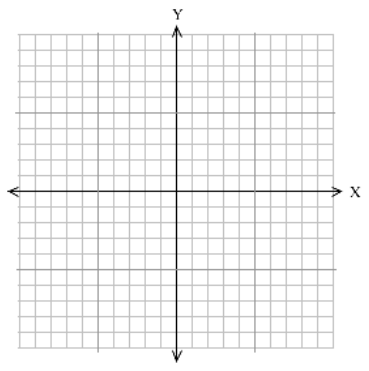
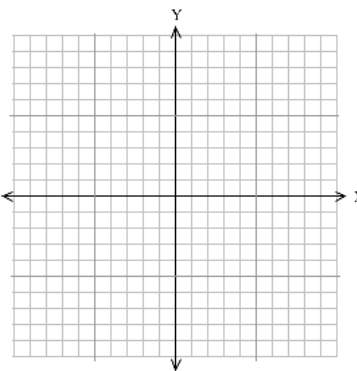
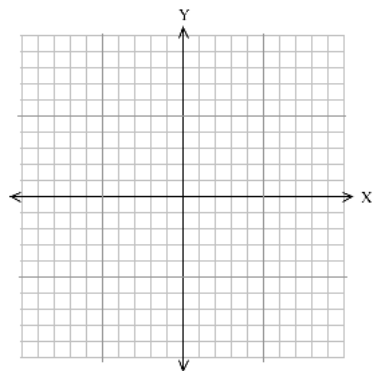
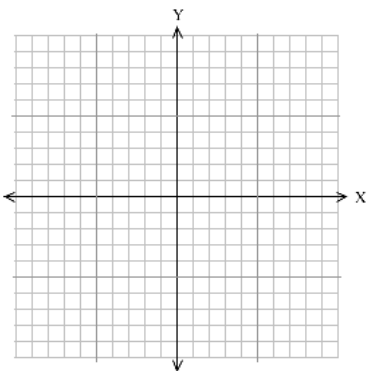
3. Knowing the graph of  $y = \sin x$ , sketch graphs of the following equations on the grids below.

a)  $y = \sin\left(x - \frac{\pi}{2}\right)$

b)  $y = \sin \frac{x}{2}$

c)  $y = 2\sin x$

d)  $y = |\sin x|$



4. Simplify:

a)  $\frac{x^3 + 27}{x^2 + 7x + 12}$

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

c)  $\frac{9 - x^{-2}}{3 + x^{-1}}$

5. Write each expression in the form  $ca^p b^q$  where  $c, p,$  and  $q$  are real numbers.

a)  $\sqrt[4]{16ab^8}$

b)  $\frac{a(2/b)}{3/a}$

c)  $\frac{a^{-1}}{(b^{-1})\sqrt{a}}$

d)  $\left(\frac{a^{2/3}}{b^{1/2}}\right)^2 \left(\frac{b^{3/2}}{a^{1/2}}\right)$

6. Solve for  $x$  (do not use a calculator)

a)  $e^{-0.2x} = 4$

b)  $\frac{1}{3} = 3^{2x+2}$

c)  $\log_2 x = 3$

d)  $\log_3 x^2 = 2\log_3 4 - 4\log_3 5$

7. Simplify.

a)  $\log_{10} 10^{1/2}$

b)  $4^{\log_2 9}$

c)  $\log_{10} \left( \frac{1}{\sqrt[3]{10}} \right)$

d)  $2\ln \sqrt{x} + 3\ln x^{1/3}$

8. Solve the following equations for the indicated variable.

a)  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ , for  $a$

b)  $A = P + nrP$ , for  $P$

c)  $2x - 2yd = y + xd$ , for  $d$

d)  $\frac{2x}{4\pi} + \frac{1-x}{2} = 0$

9. Solve for  $x$  algebraically.

a)  $4x^3 - 8x^2 - 25x + 50 = 0$

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

c)  $\frac{x+1}{x} - \frac{x}{x+1} = 0$

d)  $3\sin^2 x = \cos^2 x$  for  $0 \leq x < 2\pi$

e)  $\cos^2 x - \sin^2 x = \sin x$  for  $0 \leq x < 2\pi$

f)  $|2x + 1| = x + 3$

10. Solve the inequalities algebraically.

a)  $x^2 + 2x - 3 \leq 0$

b)  $|4 - x| \leq 1$

c)  $\frac{2x-1}{3x-2} \geq 1$

11. The equation  $12x^3 - 23x^2 - 3x + 2 = 0$  has a solution  $x = 2$ . Find all other solutions. Show your work.

12. Determine the equations of the following lines.

a) the line through  $(-1,3)$  and  $(2,-4)$

b) the line through  $(-1,2)$  and perpendicular to the line  $2x - 3y + 5 = 0$

c) the line through  $(2,3)$  and the midpoint of the line segment from  $(-1,4)$  to  $(3,2)$

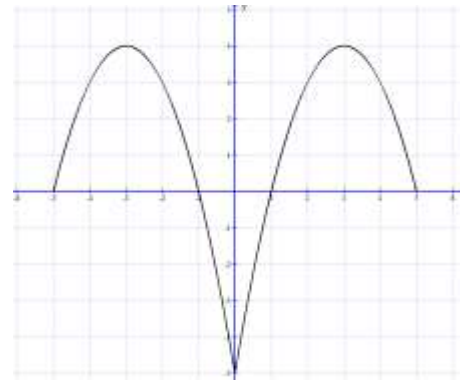
13. A circle is tangent to the  $y$ -axis at  $y = 3$  and has an  $x$ -intercept at  $x = 1$ . Find the equation of the circle in the form  $(x - h)^2 + (y - k)^2 = r^2$ . Then find the other  $x$ -intercept.

14. Simplify  $\frac{f(x+h) - f(x)}{h}$  for

a)  $f(x) = 2x^2 + x$

b)  $f(x) = \sqrt{x-3}$

c)  $f(x) = \frac{1}{x+6}$



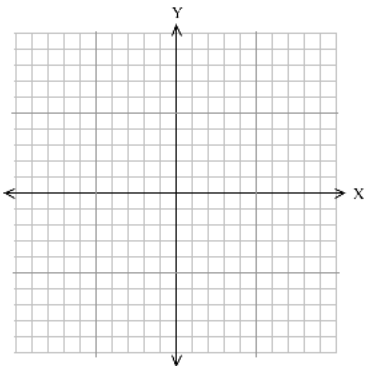
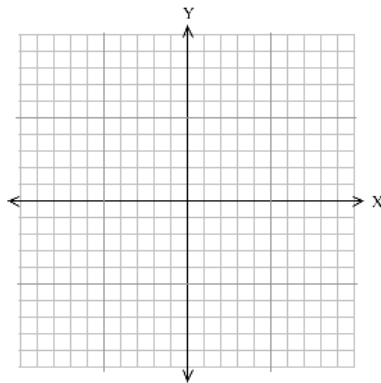
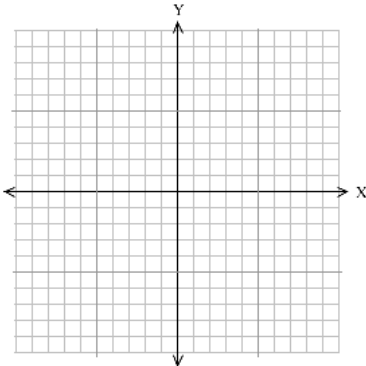
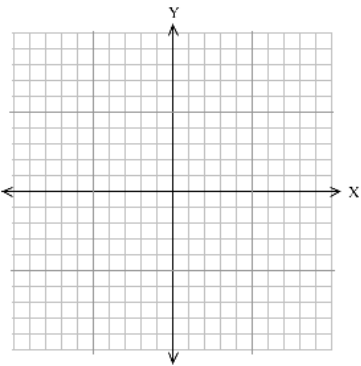
15. The graph of  $f$  is shown. Draw a graph of each function listed.

a)  $y = f(-x)$

b)  $y = -f(x)$

c)  $y = 2f(x+1) - 3$

d)  $x = f(y)$



16. The graph of a quadratic function (a parabola) has  $x$ -intercepts  $-1$  and  $3$  and a range consisting of all numbers less than or equal to  $4$ . Determine an expression for the function.

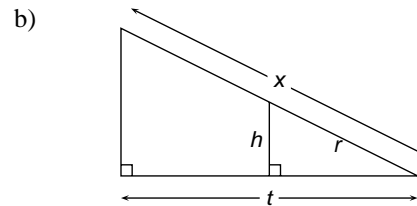
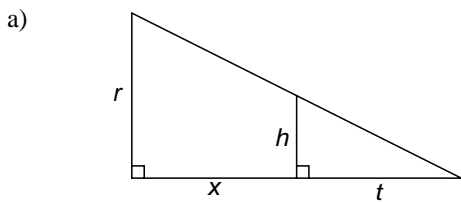


17. Find the inverse of the functions:

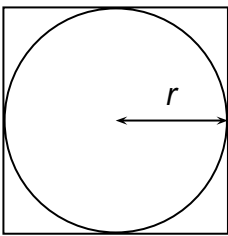
a)  $f(x) = 2x + 3$

b)  $f(x) = \frac{x+2}{5x-1}$

18. Find  $x$  in terms of the other variables in the picture.



19. Find the ratio of the area inside the square but outside the circle to the area of the square in the diagram below. Simplify.



20. Two cars start moving from the same point. One travels south at 100 km/hr, the other west at 50 km/hr. How far apart are they two hours later?

21. Determine whether the function is *even*, *odd* or *neither*.

a)  $y = x^2 + x + 1$

d)  $y = \sec x \tan x$

b)  $y = x^5 - 2x^3$

e)  $y = \sqrt{x^4 - 1}$

c)  $y = \cos x - 1$

f)  $y = \sin x + x^2$

22. Given  $f(x) = \frac{1}{\sqrt{x}}$  and  $g(x) = x^2 + 1$

- a) Find the domain and range of  $f$ .
- b) Find the domain and range of  $g$ .
- c) Find  $f(g(x))$ .
- d) Find  $g(f(x))$ .
- e) Find  $f(f(x))$ .
- f) Find the domain and range of  $g(f(x))$ .

23. Find the **domain and range** of each function below. Then sketch a graph of the function. Do not use a calculator.

a)  $y = \sin^{-1} x$

b)  $y = e^x$

c)  $y = \ln x$

d)  $y = \sqrt{16 - x^2}$

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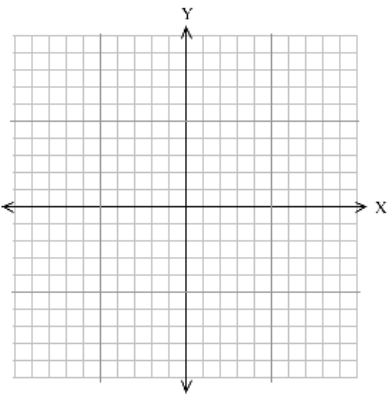
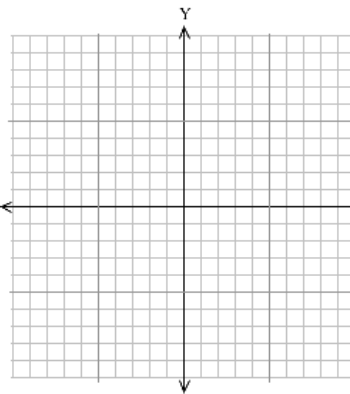
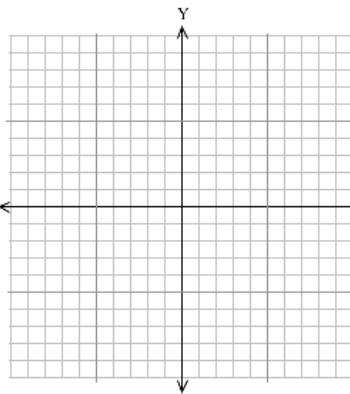
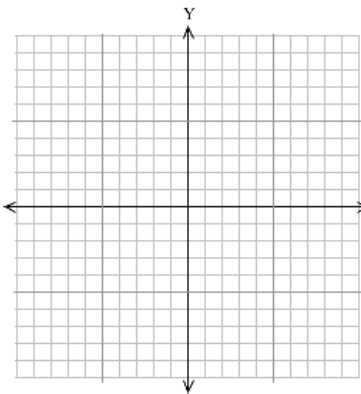
D:

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e)  $y = 1/x$

f)  $y = \cos x$

g)  $y = |x|$

h)  $y = \sqrt{x}$

D:

D:

D:

D:

R:

R:

R:

R:

