AP Calculus AB 2021-2022
Summer Assignments

Attached is a packet of problems that you need to be prepared to discuss the **<u>FIRST</u>** week of school with questions ready at that time over problems you cannot figure out. Because I realize that you may need some help with these problems, I am available through email during the summer to answer questions that you may have. Therefore, you need to attempt these problems **before the last week of July** due to the fact that I will be returning to work July 26th and will have minimal time to answer your questions then due to pre-planning responsibilities and duties. All of these assignments were taken from www.mastermathmentor.com. If you need detailed explanation of concepts in the packet, go to the above listed website and click on Pre-course (options to the left) under Calculus Materials and then click on the link that says "R U Ready?" at the left of the screen. This is where the packet/problems came from, and there are detailed notes for each section explaining concepts. <u>Please take the initiative to look at these notes if you have questions prior to arriving the first day of school and try to refresh your memory on these topics!</u>

The first two pages following this introductory letter is just NOTES. The problems you need to complete are on the subsequent pages. Your solutions/graphs should include **<u>all work necessary with the solutions</u>**. You do NOT need a calculator for these problems. All solutions should be real numbers and in exact form.

<u>It is absolutely IMPERATIVE that you are fully knowledgeable of the graphs of ALL parent functions, their domain and range, and are able to solve ALL types of equations. Please make sure you know the unit circle as well. Calculus utilizes ALL prior knowledge from previous math courses.</u>

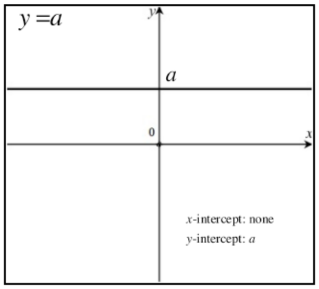
I will be checking my school e-mail periodically during the summer. If I am on vacation/out of town, it may take several days to get back with you.

Ms. Willis: willis.emily@mail.fcboe.org

I look forward to working with you next year!

C. Graphs of Common Functions

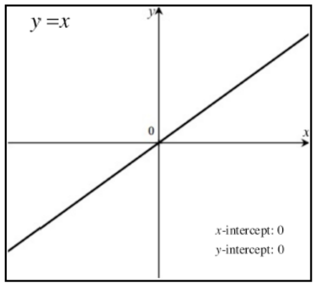
There are certain graphs that occur all the time in calculus and students should know the general shape of them, where they hit the x-axis (zeros) and y-axis (y-intercept), as well as the domain and range. There are no assignment problems for this section other than students memorizing the shape of all of these functions. In section 5, we will talk about transforming these graphs.



Function: $y = a$

Domain: $(-\infty, \infty)$

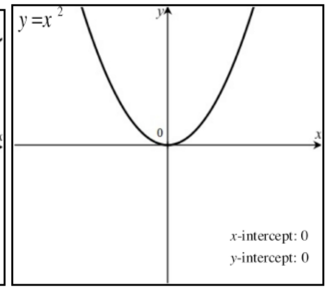
Range: $[a, a]$



Function: $y = x$

Domain: $(-\infty, \infty)$

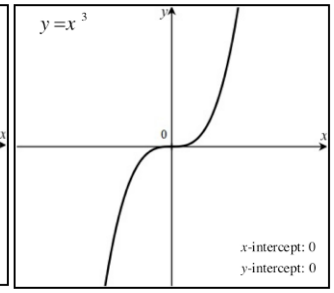
Range: $(-\infty, \infty)$



Function: $y = x^2$

Domain: $(-\infty, \infty)$

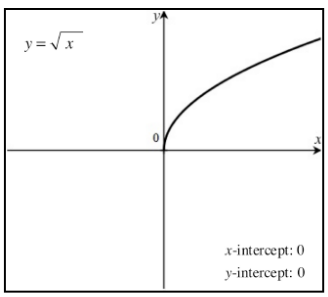
Range: $[0, \infty)$



Function: $y = x^3$

Domain: $(-\infty, \infty)$

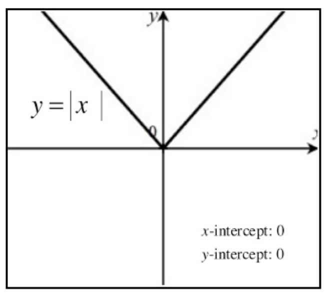
Range: $(-\infty, \infty)$



Function: $y = \sqrt{x}$

Domain: $[0, \infty)$

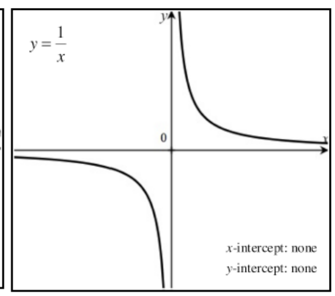
Range: $[0, \infty)$



Function: $y = |x|$

Domain: $(-\infty, \infty)$

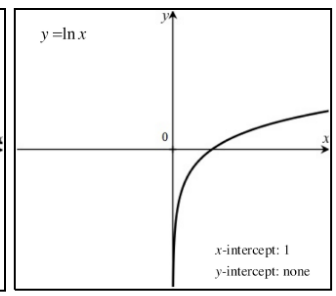
Range: $[0, \infty)$



Function: $y = \dfrac{1}{x}$

Domain: $x \neq 0$

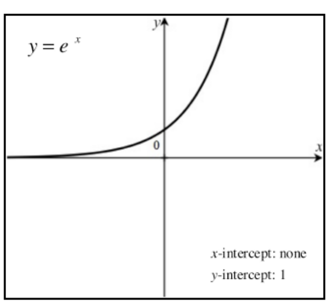
Range: $y \neq 0$



Function: $y = \ln x$

Domain: $(0, \infty)$

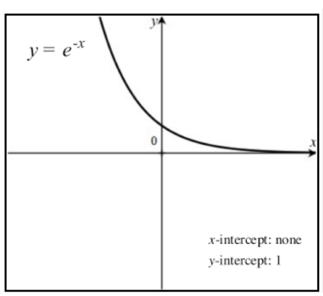
Range: $(-\infty, \infty)$



Function: $y = e^x$

Domain: $(-\infty, \infty)$

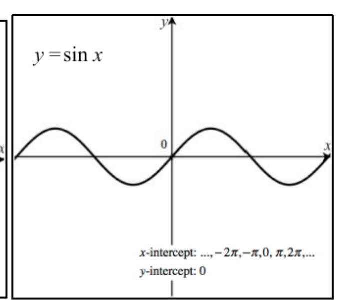
Range: $(0, \infty)$



Function: $y = e^{-x}$

Domain: $(-\infty, \infty)$

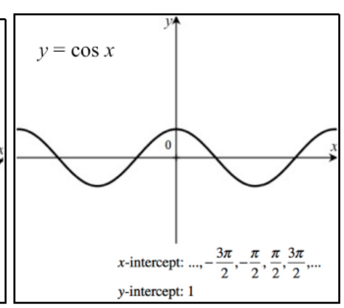
Range: $(0, \infty)$



Function: $y = \sin x$

Domain: $(-\infty, \infty)$

Range: $[-1, 1]$



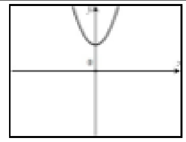
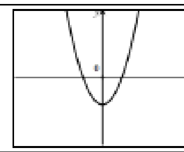
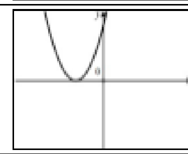
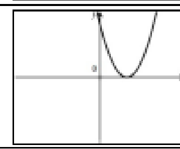
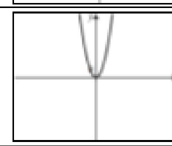
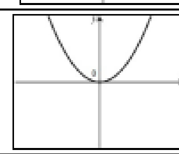
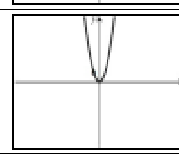
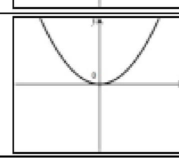
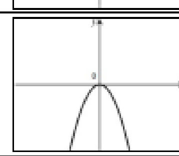
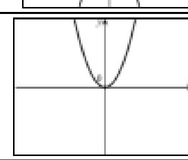
Function: $y = \cos x$

Domain: $(-\infty, \infty)$

Range: $[-1, 1]$

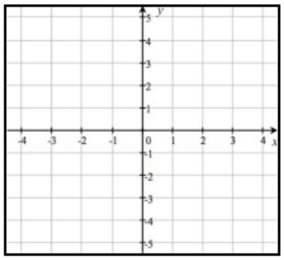
E. Transformation of Graphs

A curve in the form $y = f(x)$, which is one of the basic common functions from section C can be transformed in a variety of ways. The shape of the resulting curve stays the same but zeros and y-intercepts might change and the graph could be reversed. The table below describes transformations to a general function $y = f(x)$ with the parabolic function $f(x) = x^2$ as an example.

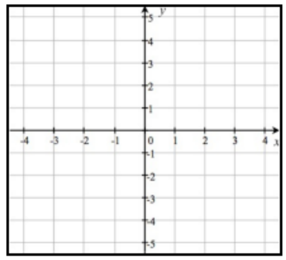
Notation	How $f(x)$ changes	Example with $f(x) = x^2$
$f(x)+a$	Moves graph up a units	
$f(x)-a$	Moves graph down a units	
$f(x+a)$	Moves graph a units left	
$f(x-a)$	Moves graph a units right	
$a \cdot f(x)$	$a > 1$: Vertical Stretch	
$a \cdot f(x)$	$0 < a < 1$: Vertical shrink	
$f(ax)$	$a > 1$: Horizontal compress (same effect as vertical stretch)	
$f(ax)$	$0 < a < 1$: Horizontal elongated (same effect as vertical shrink)	
$-f(x)$	Reflection across x-axis	
$f(-x)$	Reflection across y-axis	

E. Transformation of Graphs Assignment
Sketch the following equations:

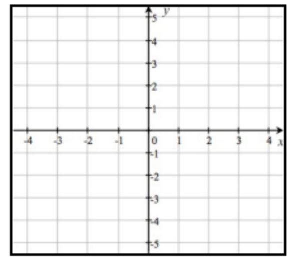
1. $y = -x^2$



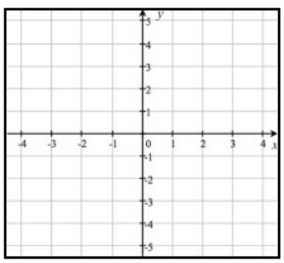
2. $y = (x - 2)^2$



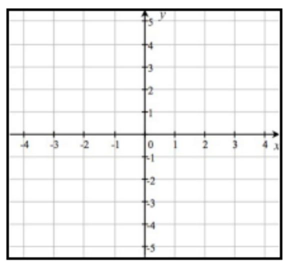
3. $y = 2 - \sqrt{x}$



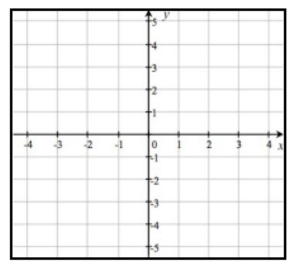
4. $y = \sqrt{x+1} + 1$



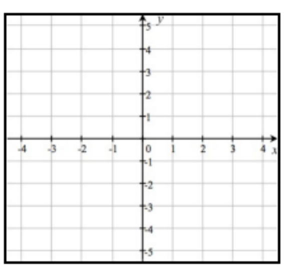
5. $y = -2|x - 1| + 4$



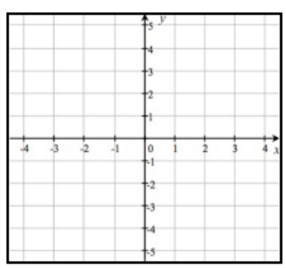
6. $y = 2^x - 2$



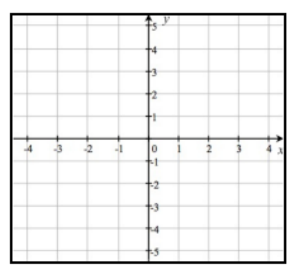
7. $y = -2^{(x + 2)}$



8. $y = \ln(x - 3)$



9. $y = \frac{-2}{x+1}$



F. Special Factorization – Assignment
Completely factor the following expressions.

1. $x^3 - 25x$

2. $3x^3 - 5x^2 + 2x$

3. $3x^8 - 3$

4. $9a^4 - a^2b^2$

5. $4x^4 + 7x^2 - 36$

6. $250x^3 - 128$

7. $x^6 - 9x^4 - 81x^2 + 729$

8. $x^6 - 1$

9. $x^6 + 1$

G. Linear Functions – Assignment

1. Find the equation of the line in point-slope form, with the give slope, passing through the given point.

Slope = $\frac{2}{3}$, $\left(-6, \frac{1}{3}\right)$

2. Find the equation of the line in point-slope form, passing through the following points.

$\left(-2, \frac{2}{3}\right)\ and\ \left(\frac{1}{2}, 1\right)$

3. Write equations of the line through the given point a) parallel and b) perpendicular to the given line. Write your equations in point-slope form.

(-6, 2), 5x + 2y = 7

4. Find an equation of the line containing (4, -2) and parallel to the line containing (-1, 4) and (2, 3). Put your answer in point-slope form.

5. Find *k* if the lines 3x – 5y = 9 and 2x + *k*y = 11 are a) parallel and b) perpendicular.

H. Solving Equations Assignment
Solve for all real solutions of x. Leave answers in exact form.

1. $x^2 + 7x - 18 = 0$

2. $2x^2 - 72 = 0$

3. $12x^2 - 5x = 2$

4. $3x - 4x^2 = -5$

5. $7x^2 - 7x + 2 = 0$

6. $x^3 - 5x^2 + 5x - 25 = 0$

7. If $y = x^2 + kx - k$, for what values of k will the quadratic equation have two real solutions?

8. Find the domain of $y = \frac{2x-1}{6x^2-5x-6}$.

I. Asymptotes – Assignment

Find all vertical and horizontal asymptotes and if present, the location of holes, for the graph of

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

2. $y = \frac{2x+16}{x+8}$

3. $y = \frac{x}{x^2-25}$

4. $y = \frac{x^2-5}{2x^2-12}$

5. $y = \frac{x^3+4x}{x^3-2x^2+4x-8}$

6. $y = \frac{10x+20}{x^3-2x^2-4x+8}$

7. $y = \frac{1}{x} - \frac{x}{x+2}$
(hint: express with a common denominator first)

P. Exponential Functions and Logarithms – Assignment

Find:

1. $log_8 4$

2. $ln\frac{1}{\sqrt[3]{e^2}}$

3. $log_3(\sqrt{3})^5$

4. $log_2\frac{2}{3} + log_2\frac{3}{32}$

5. $log_{\frac{1}{3}}\frac{4}{3} - log_{\frac{1}{3}}12$

Solve.

6. $log_9(x^2 - x + 3) = \frac{1}{2}$

7. $log_2(x - 1) + log_2(x + 3) = 5$

8. $log_5(x + 3) - log_5 x = 2$

9. $lnx^3 - lnx^2 = \frac{1}{2}$

10. $3^{x-2} = 18$

11. $e^{3x+1} = 10$

12. $8^x = 5^{2x-1}$

T. Solving Trig Equations and Inequalities – Assignment
Solve for x on $[\mathbf{0}, \mathbf{2\pi})$.

1. $\sin^2 x = \sin x$

2. $3\tan^3 x = \tan x$

3. $\sin^2 x = 3\cos^2 x$

4. $\cos x + \sin x \tan x = 2$

5. $\sin x = \cos x$

6. $2\cos^2 x + \sin x - 1 = 0$

7. Solve for x on $[0,2\pi)$: $\frac{x-\pi}{cos^2 x} < 0$