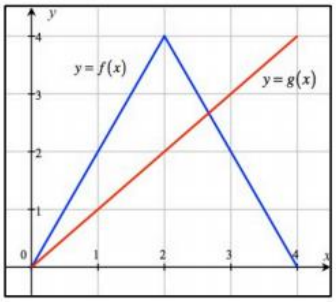
BE SURE TO READ THE DIRECTIONS PAGE & MAKE YOUR NOTECARDS **FIRST**!!

A. Functions

1. If $f(x) = 4x - x^2$, find $\frac{f(x+h)-f(x-h)}{2h}$.

2. If $f(x)$ and $g(x)$ are given in the graph to the right, find $f(g(3))$.



3. If $f(x) = \begin{cases} \sqrt{x+2} - 2, & x \geq 2 \\ x^2 - 1, & 0 \leq x < 2 \\ -x, & x < 0 \end{cases}$, find $\sqrt{5 - f(-4)}$

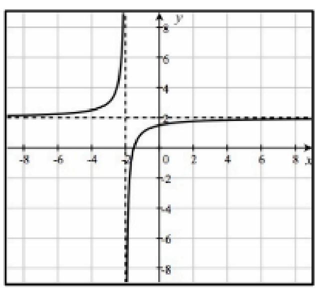
B. Domain and Range

- Find the domain of the following functions using interval notation:

4. $y = \frac{\sqrt{2x+14}}{x^2-49}$

5. $y = \frac{\sqrt{5-x}}{\log x}$

6. Find the domain and range of the following function using interval notation.



C. Graphs of Common Functions

7. Graph each parent graph listed in the chart and then answer the following questions about the indicated functions. In completing the table below, you may use the following abbreviations, R: the set of real numbers, J: the set of integers, and N: the set of natural numbers.

Function	Domain	Range $y = f(x)$	Zeros (Find x when $f(x) = 0$)	Symmetry with respect to y-axis or origin	Even or Odd Function— $f(-x) = f(x)$ or $f(-x) = -f(x)$	Is the function periodic? If so, state the period.	Is $f(x)$ a one-to-one function? (For each $f(x)$ only one x exists)
(a) $f(x) = x^2$							
(b) $f(x) = x^3$							
(c) $f(x) = \lvert x \rvert$							
(d) $f(x) = \sin x$							
(e) $f(x) = \cos x$							
(f) $f(x) = \tan x$							
(g) $f(x) = \sec x$							
(h) $f(x) = 2^x$							
(i) $f(x) = \log_2 x$							
(j) $f(x) = \frac{1}{x}$							
(k) $f(x) = \sqrt{x}$							
(l) $f(x) = \sqrt{a^2 - x^2}$							

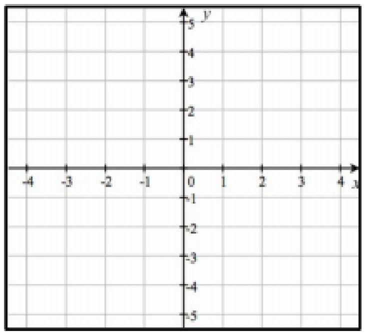
D. Even and Odd Functions – Please read through the examples for understanding; you have no required problems in this section.

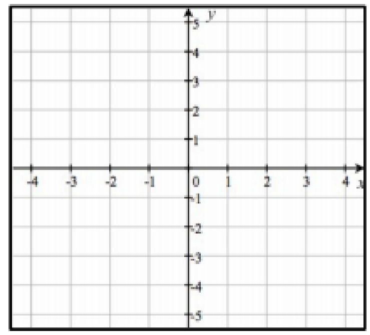
E. Transformations of Graphs

- List your translations and then sketch the following equations.

8. $y = -2^{x+2}$

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





F. Special Factorizations

- Completely factor the following expressions

10. $3x^8 - 3$

11. $4x^4 + 7x^2 - 36$

12. $16x^{4a} - y^{8a}$

G. **Linear Functions**

- Write equations of the line **in point-slope form** that pass

13. through (5, -3) that is parallel to $x + y = 4$

14. through (-6, 2) that is normal to $5x + 2y = 7$

15. through (-3, 4) that is normal to $y = -2$

16. Find k if the lines $3x - 5y = 9$ and $2x + ky = 11$ are parallel.

17. Find k if the lines $3x - 5y = 9$ and $2x + ky = 11$ are perpendicular.

H. **Solving Quadratic Equations**

18. Solve for x: $x^3 - 5x^2 + 5x - 25 = 0$

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

I. **Asymptotes**

- Find any vertical and horizontal asymptotes and if present, the location of holes, for the graphs of

20. $y = \frac{2x^2+6x}{x^2+5x+6}$

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

J. Negative and Fractional Exponents

- Simplify and write with positive exponents.

22. $x(x^{1/2} - x)^{-2}$

23. $(x^{-2} + 2^{-2})^{-1}$

K. Eliminating Complex Fractions

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

25. $\frac{2x(2x-1)^{1/2}-2x^2(2x-1)^{-1/2}}{(2x-1)}$

L. Inverses

25. Find the inverse of $f(x) = \frac{x^2}{x^2+1}$ and then show that $f(f^{-1}(x)) = x$.

26. Without finding the inverse, find the domain and range of the inverse of $(x) = \frac{\sqrt{x+1}}{x^2}$.

M. Adding Fractions and Solving Fractional Equations

27. Solve: $\frac{2x-1}{x-1} - \frac{3x}{2x+1} = \frac{x^2+11}{2x^2-x-1}$

N. Solving Absolute Value Equations

- In Calculus, we are more concerned with you being able to rewrite equations as piece-wise functions with the correct domains, then we are with you solving the equations.
- Directions: Rewrite each absolute value function as a piece-wise function (show your number line test):

Example: $f(x) = |x-4|$

$x - 4 = 0$
$x = -4$

Numberline Test

--------------0++++++++
-4

$x = -5, (-5) - 4 < 0$
$x = 0, (0) - 4 > 0$

$f(x) = \begin{cases} -x+4, x < -4 \\ x-4, x \geq -4 \end{cases}$

Algebraically:
1. Find zeros of f(x) to break the function up into the correct pieces.
2. Do a numberline test to decide which pieces need to be negative.
3. Multiply the negative through the function for the pieces that are negative.
4. Set up the piecewise function with each corresponding domain.

Example: $f(x) = |x^2 - 4|$

$x^2 - 4 = 0$
$x = \pm 2$

Numberline Test

++++0-----------0++++
-2 2

$x = -3, (-3)^2 - 4 > 0$
$x = 0, (0)^2 - 4 < 0$
$x = 3, (3)^2 - 4 > 0$

$f(x) = \begin{cases} x^2-4, x \leq -2 \\ -x^2+4, -2 < x < 2 \\ x^2-4, x \geq 2 \end{cases}$

Algebraically:
1. Find zeros of f(x) to break the function up into the correct pieces.
2. Do a numberline test to decide which pieces need to be negative.
3. Multiply the negative through the function for the pieces that are negative.
4. Set up the piecewise function with each corresponding domain.

28. $y = |x+8|$

29. $y = |x^2 - 2x + 1|$

O. Solving Inequalities

30. Show your number line test when solving: $x + 7 \geq |5 - 3x|$

31. Show your number line test when finding the domain of $\sqrt{\frac{x^2-x-6}{x-4}}$

P. Exponential Functions and Logarithms

- Solve each equation

32. $\log(x-3) + \log 5 = 2$

33. $\ln x^3 - \ln x^2 = \frac{1}{2}$

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

35. $8^x = 5^{2x-1}$

Q. Right Angle Trigonometry

36. If $\csc\theta = \frac{6}{5}, \theta$ in Quadrant II, find $\cos\theta$ & $\tan\theta$.

37. If $\cot\theta = \frac{-2\sqrt{10}}{3}$, find all values of $\sin\theta$ & $\cos\theta$.

R. Special Angles

- You must know your unit circle or draw triangles to evaluate each expression:

38. $\left(\cos\frac{2\pi}{3} - \tan\frac{3\pi}{4}\right)^2$

39. $\left(\sin\frac{11\pi}{6} - \tan\frac{5\pi}{6}\right)\left(\sin\frac{11\pi}{6} + \tan\frac{5\pi}{6}\right)$

S. Trigonometric Identities

- You must be able to recognize trig identities when they “show up” in your work in Calculus. Thus, you MUST know the following identities:

Fundamental Trig Identities

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

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

Sum Identities

$$\sin(A+B) = \sin A \cos B + \cos A \sin B \qquad \cos(A+B) = \cos A \cos B - \sin A \sin B$$

Double Angle Identities

$$\sin(2x) = 2\sin x \cos x \qquad \cos(2x) = \cos^2 x - \sin^2 x = 1 - 2\sin^2 x = 2\cos^2 x - 1$$

T. Trigonometric Equations and Inequalities

- Solve for x on $[0,2\pi)$

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

41. $3tan^3 x = \tan x$

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

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

44. $\sin x = \cos x$

45. $2cos^2 x + \sin x - 1 = 0$

U. **Graphical Solutions to Equations and Inequalities**

- Draw a quick sketch and list your window to show what you used to solve each equation.

46. Use the calculate zero feature of your g.c., to solve: $3x^3 - x - 5 = 0$

47. Use the calculate intersection feature of your g.c. to solve: $2\ln(x+1) = 5\cos x \ on\ [0,2\pi)$

48. Use the calculate zero feature of you g.c, to solve the inequality $\frac{x^2-4x-4}{x^2+1} > 0\ on\ [0,8]$

(<u>Remember</u>: > graphically implies above the x-axis)

DON'T FORGET TO TAKE THE **<u>SURVEY</u>** (lymanapcalculusab.weebly.com) & READ THE ADVICE LETTERS FROM LAST YEAR'S AP CALCULUS BC STUDENTS!