AB Calculus Summer Review Packet
For Students whose most recent course was
Prep or PAP Pre-Calculus
DUE <u>FIRST DAY</u> OF CLASS IN THE FALL!!!

Welcome to the AB Calculus class!! This course is a fast-moving one which will require that you stay on top of your studies and work a little math every day. If you are enrolled in this course, it means that you were average to strong in PAP Pre-Calculus (or strong in Prep Pre-Calculus) and are capable of handling the <u>rigor</u> of this course. You will have the opportunity to take the AB Calculus Exam in May to earn AB credit (the equivalent of a college Calculus 1 course).

The problems in this packet are designed to see what you know from your PAP Pre-Calculus or Prep Pre-Calculus Course. It will help me see what you remember and do not remember. Also, it will help me assess if you should be taking this course.

PACKAGE FORMAT:

- **Part 1 (First 20 Problems):**
    - **No calculators** are to be used.
    - Work on your own paper in an organized manner.
    - Use resources available to you to work on these problems
        - This includes Khan Academy. This does NOT include tutors, or internet sites that work out the problem for you, etc.
- **Part 2 (Second 20 Problems):**
    - Calculators **will** need to be used for some problems.
        - You still must show work.
    - Work on your own paper in an organized manner.
    - Use resources available to you to work on these problems
        - This includes Khan Academy. This does NOT include tutors, or internet sites that work out the problem for you, etc..
- Solutions to the problems contained in this packet will be made the first day of class in the fall.
- The MOST important thing for you to know is that it is the ALGEBRA involved in Calculus that makes Calculus difficult, so please be sure that you work **very hard** on mastering the concepts that are contained in this packet!!! If these are too difficult for you, it might be that AP Calculus AB is not the best course for you next year.

- **There will be a Quiz over this material the second day of class!!**

- Finally, honor and integrity is at the heart of a Westside Wolf! Smart wolves never cheat. You are only hurting yourself by attempting to copy someone else's work. This packet is to help you be ready for AP Calculus AB and to help me know what you can do.

PART 1:

1. Show that $y = \dfrac{x}{x^2 + 1}$ is symmetric with respect to the origin.

2. Find the intercepts: $y = \dfrac{2x - 1}{3 - x}$.

3. Find all points of intersection: $y = -x^2 + 4x$ and $y = x^2$.

4. Find an equation in general form for the straight line that passes through the point $(-1, 4)$ and is perpendicular to the line $2x + 3y = 6$.

5. If $g(x) = x^2 + 3x - 1$, find $\dfrac{g(x + \Delta x) - g(x)}{\Delta x}$.

6. If $f(x) = \dfrac{1}{\sqrt{x}}$ and $g(x) = x^2 - 5$, find $g(f(x))$.

7. Find the domain: $f(x) = \dfrac{1}{x^2 - 2x - 2}$.

8. Sketch a graph of $y = x^3 - 1$.

9. Sketch the graph of the equation $4x - 2y + 8 = 0$.

10. In which of the following equations is y a function of x?

    a. $3x + 2y - 7 = 0$ b. $5x^2y = 9 - 2x$ c. $3x^2 - 4y^2 = 9$

    d. $x = 3y^2 - 1$ e. None of these

11. Determine whether the function is even, odd, or neither. Justify your answer.

    $f(x) = -x^5 + 3x^3 - 2x + 1$

12. Use the graph of $f(x) = |x|$ to sketch the graph of $y = |x - 1| + 3$.

13. Find the slope and y-intercept of the line given by the equation $5x + 4y - 12 = 0$.

14. Let $f(x) = \begin{cases} x^2 - 4, & x < 2 \\ 3 - 2x, & x \geq 2 \end{cases}$. Evaluate:

    a. $f(0)$ **b.** $f(2)$ **c.** $f(3)$

15. A student working for a telemarket company gets paid $3 per hour plus $1.50 for each sale. Let x represent the number of sales the student has in an 8-hour day.

    a. Write a linear equation giving the day's salary S in terms of x.

    b. Use the linear equation to calculate the student's salary on Wednesday if the student makes 14 sales that day.

    c. Use the linear equation to calculate the number of sales per day the student would have to make in order to earn at least $100 a day.

16. Determine whether $f(x) = \dfrac{1}{ax + b}$ is one-to-one; if it is, find f^{-1}.

17. Write an algebraic expression for $\tan[\arcsin x]$. $\left(-\dfrac{\pi}{2} \leq \arcsin x \leq \dfrac{\pi}{2} \right)$

18. Let $f(x) = x^3 + 5$. Find f^{-1}.

19. Solve for x: $\ln(5x - 1) - \ln x = 3$.

20. Solve for x: $(x - 2)^{3/2} = 8$.

PART 2:

**A graphing calculator is recommended for some problems in this problem set.**

1. Given the equation: $x^2 + y^2 + 4x - 6y + 12 = 0$.
   a. Solve for y.
   b. Use a graphing utility to graph the resulting equations on the same set of axes and sketch the graph.

2. Create an equation whose graph has intercepts at $(-5, 0)$, $(0, 0)$, and $(5, 0)$.

3. a. Use a graphing utility to graph the equation $y = x^4 - 3x^2 + 2$.
   b. Identify the intercepts of the graph.
   c. Test for symmetry.

4. Identify the type(s) of symmetry: $x^2 + xy + y^2 = 0$.

5. Find all points of intersection of the graphs of $x^2 - 2x - y = 6$ and $x - y = -4$.

6. Sketch the graph of the equation: $4x - 2y + 8 = 0$.

7. Let $f(x) = \begin{cases} |x|, & x < 2 \\ x - 3, & x \geq 2 \end{cases}$. Evaluate:
   a. $f(-3)$ b. $f(-2)$
   c. $f(0)$ d. $f(2)$

8. Let $f(x) = x + \sqrt{x + 2}$.
   a. Use a graphing utility to graph $y = f(x)$.
   b. Estimate the domain and range from the graph.
   c. Estimate the coordinates of any intercepts of the graph.
   d. Find the intercepts analytically.

9. Use a graphing utility to estimate the zero(s) of $f(x) = x^3 - 5x + 2$.

10. In which of the following is y a function of x?
    a. $y = 3x^2 - 9$ b. $x^2 + y^2 = 7$ c. $x^2 - y^2 = 2$
    d. $3x + 2y = 5$ e. $|x| = y$

11. Given $f(x) = |3x - 6|$, find $f(0) - f(3)$.

12. Find $\dfrac{g(x + \Delta x) - g(x)}{\Delta x}$ for $g(x) = x^2 + 3x - 1$.

13. Determine whether the function $f(x) = -x^4 + 2x^2 - 1$ is even, odd, or neither. Justify your answer.

14. Use the graph of f shown below to sketch the graph of $y = f(x) - 2$.
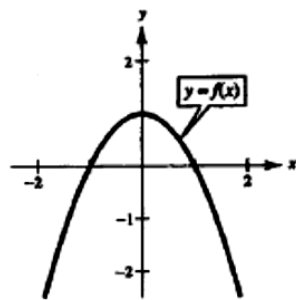
15. For the functions $f(x) = x - 2$ and $g(x) = \dfrac{x + 5}{3}$, find $g(f(x))$.

16. A business had annual retail sales of $224,000 in 1993 and $186,500 in 1996. Assume the annual decrease in sales follows a linear pattern.

    a. Write a linear equation giving sales S in terms of the year t where $t = 0$ corresponds to 1993.

    b. Use a graphing utility to graph the equation.

    c. Use the graph to estimate the annual retail sales for 1998 to two digits of precision (the nearest multiple of $10,000).

    d. Use the graph to estimate the first year when there will be no sales.

17. If $\ln a = 2.565$ and $\ln b = 3.045$, find:

    a. $\ln(ab)$

    b. $\ln \sqrt{a}$

18. Use a graphing utility to graph the function $f(x) = x \ln x$. Use the graph to determine whether the function is one-to-one over its entire domain.

19. Find the exact value: $\cos\left[\arctan\left(-\tfrac{3}{10}\right)\right]$.

20. Solve for x: $e^{4x+1} = 3$.