AP CALCULUS AB & BC

~Σer Work and List of Topical Understandings~

As instructors of AP Calculus, we have extremely high expectations of students taking our courses. As stated in the district program planning guide, we expect a certain level of independence to be demonstrated by anyone taking AP Calculus. Your first opportunity to demonstrate your capabilities and resourcefulness to us is through this summer work packet which will help you maintain/improve your skills. This packet is a **requirement** for those entering either AP Calculus AB or AP Calculus BC and is due on the first of class. If it is not completed when handed in on the first day of class, you may be transferred to Regular Calculus. Work on as much of this packet on your own as you can, then get together with a friend, e-mail one of the teachers or "google" the topic. **SHOW US YOUR BEST WORK!**

The following are guidelines for completing the summer work packet…

- ✓ There are 34 (AB) or 41 (BC) questions you must complete. You must show us all of your quality work. There is enough room for you to show your work in the packet.
- ✓ Be sure all problems are neatly organized and all writing is legible.
- ✓ In the event that you are unsure how to perform functions on your calculator, you may need to read through your calculator manual to understand the necessary syntax or keystrokes. You must be familiar with certain built-in calculator functions such as finding maximum and minimum values, intersection points, and zeros of a function. You will also need to be able to do regression analysis on your calculators.
- ✓ We expect you to come in with certain understandings that are prerequisite to Calculus. A list of these topical understandings is below. Please be familiar with all of these and ready to apply them to a higher level.

Topical understandings within summer work…

- ❖ Factoring
- ❖ Zeros/roots/x-intercepts of rational and polynomial functions
- ❖ Unit Circle
- ❖ Composite function and notation
- ❖ Limits of functions
- ❖ Solving trigonometric equations
- ❖ Domain/Range
- ❖ Interpreting and comprehending word problems
- ❖ Regression analysis
- ❖ Graphing, simplifying expressions, and solving equations of the following types:
  trigonometric, rational, piecewise, logarithmic, exponential, polynomial/power, radical, polar, and parametric.

Finally, we suggest not waiting until the last two weeks of summer to begin on this packet. If you spread it out, you will most likely retain the information much better. Once again this is due, completed with quality, on the first day of class. Best of luck and if you have any questions, feel free to contact us.

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First impressions are lasting impressions…impress us!!

If I have seen farther than others it is because

I have stood on the shoulders of giants.

1) Simplify $\frac{\sqrt[7]{x^9}}{\sqrt[5]{x^6}}$. Express your answer using a single radical.

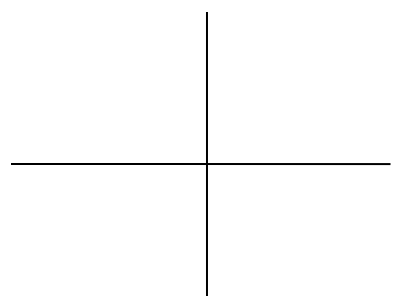
2). Factor completely. $6x^3 - 17x^2 + 5x$

3) Determine the range of: $f(x) = 13 - 20x - x^2 - 3x^4$. Also, find the max. and min. values of $f(x)$, and state where those values occur.

4) Find the equation of the line through $(-2, 7)$ and $(3, 5)$ in point slope form.

5) Solve the equation both algebraically and graphically.

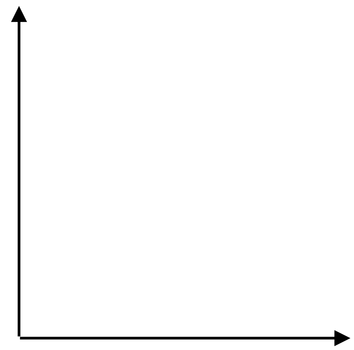
$|4x - 3| = 5\sqrt{x+4}$



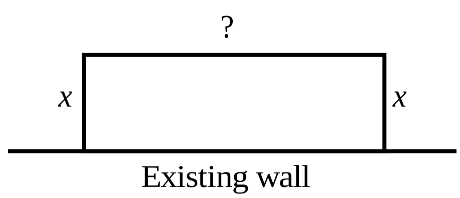
6) Rewrite the expression $\log_5(x+3)$ into an equivalent expression using only natural logarithms

7) The table shows average salaries for employees of Mediocre Tool, Inc. Find a linear regression equation for the data and graph the equation with a scatter plot of the data. Then use that equation to estimate the average salary in 2008. (Use $x = 0$ for 1975, and express values to the nearest hundredth)

YEAR	Average Salary ($)
1975	15.642
1980	16,580
1985	17,409
1990	19,150
1995	20,491
2000	21,925



8) Three sides of a fence and an existing wall form a rectangular enclosure. The total length of a fence used for the three sides is 240 ft. Let x be the length of two sides perpendicular to the wall as shown. Write an equation of area A of the enclosure as a function of the length x of the rectangular area as shown in the above figure. The find value(s) of x for which the area is 5500 ft^2



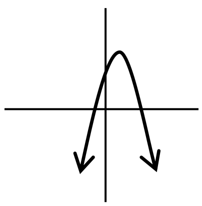
9) Let $f(x) = \sqrt{x-3}$ and $g(x) = x^2 + 1$. Compute $(g \circ f)(x)$, state its domain in interval notation.

10) Let $f(x) = \dfrac{3x+7}{x-2}$. Find $f^{-1}(x)$, the inverse of $f(x)$

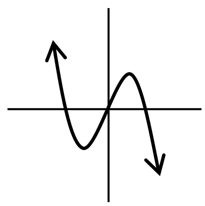
11) Find an equation for the parabola whose vertex is $(2,-5)$ and passes through $(4,7)$. Express your answer in the standard form for a quadratic.

12) Which of the following could represent a complete graph of $f(x)=ax-x^3$, where a is a real number?

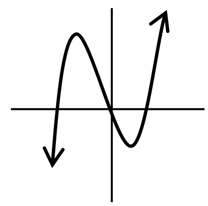
A.



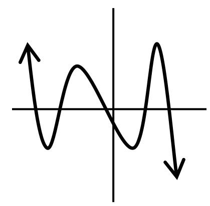
B.



C.



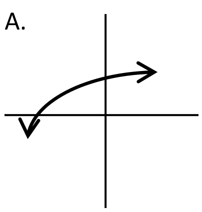
D.



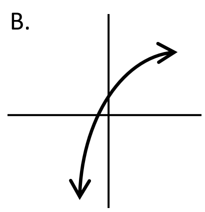
13) Find a degree 3 polynomial with zeros -2, 1, and 5 and going through the point $(0,-3)$.

14) The graph of $y=2-a^{x+3}$ for $a>1$ is best represented by which graph?

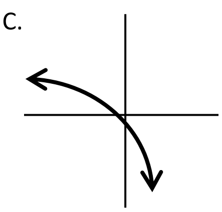
A.



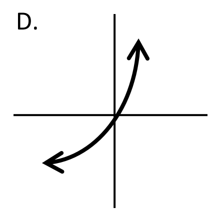
B.



C.



D.



15) Describe the transformations that can be used to transform the graph of $\log(x)$ to a graph of $f(x)=4\log(x+2)-3$.

16) The number of elk after t years in a state park is modeled by the function $P(t)=\dfrac{1216}{1+75e^{-0.03t}}$.

a) What was the initial population of elk?
b) When will the number of elk by 750?
c) What is the maximum number of elk possible in the park?

17) Arturo invests $2700 in a savings account that pay 9% interest, compounded quarterly. If there are no other transactions, when will his balance reach $4550?

18) Simplify $\left(\csc(x)-\tan(x)\right)\sin(x)\cos(x)$

A. $\sin(x)-\cos^2(x)$ B. $\cos(x)-\sin^2(x)$

C. $\sin^2(x)+\cos(x)$ D. $\cos^2(x)-\sin(x)$

19) Without using a calculator, find the exact value of $\cos^{-1}\left(\cos\left(\dfrac{17\pi}{5}\right)\right)$. Justify your answer.

20) Solve the inequality $x^2-x-12>0$.

A. $(-\infty,-4)\cup(3,\infty)$ B. $x=4,\ x=-3$ C. $(-3,4)$ D. $(-\infty,-3)\cup(4,\infty)$

21) Find the perimeter of a 30° slice of cheesecake if the radius of the cheesecake is 8 inches.

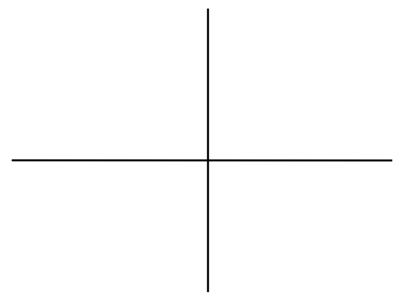
22) Determine $\lim_{x \to 0} \frac{\sin(x)}{x^2 - x}$. Explain your answer.

23) Determine the sum, if it exists, of the infinite geometric series…

$$4 + \frac{4}{3} + \frac{4}{9} + \frac{4}{27} + \ldots$$

24) Solve the system of equations graphically, accurate to the nearest thousandth. Please sketch and label your solution on the graph provided.

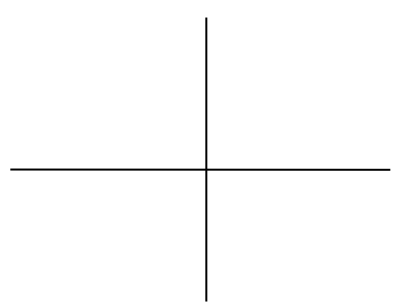
$$\frac{x^2}{2} + \frac{y^2}{5} = 1$$
$$y = \frac{1}{3}x$$



25) Two students are 180 feet apart on opposite sides of a telephone pole. The angles of elevation from the students to the top of the pole are $35°$ and $23°$. Find the height of the telephone pole.

26) Graph the piecewise function.

$$f(x) = \begin{cases} -x^2 & -2 \le x < 1 \\ -2 & x = 1 \\ 3x + 5 & 1 < x \le 3 \end{cases}$$

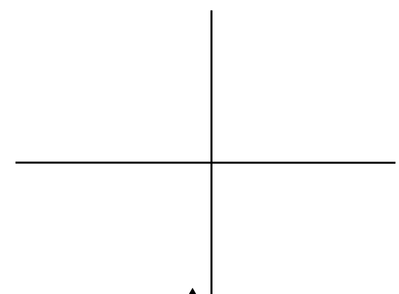


27) Solve the equation $2\sin^2(x)\cos(x)=\cos(x)$ algebraically.

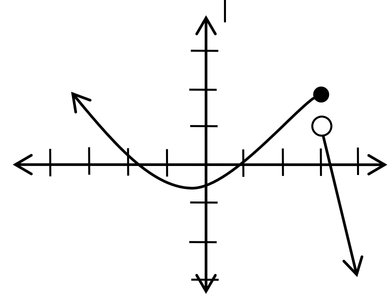
28) Find all the exact solutions to $2\sin^2(x)+3\sin(x)-2=0$ on the interval $[0,2\pi)$.

29) Find the points of intersection of

$x^2+y^2=4$ and $x^2+y^2-4x-4y=-4$



30) For the function $f(x)$ graphed, evaluate $\lim\limits_{x\to 3} f(x)$



A. $\lim\limits_{x\to 3} f(x)=2$

B. $\lim\limits_{x\to 3} f(x)=3$

C. $\lim\limits_{x\to 3} f(x)=1$

D. $\lim\limits_{x\to 3} f(x)$ DNE

31) Use a graphing calculator to solve the following for x. $e^{2x}=3x^2$

32) Find the domain of $f(x)=\dfrac{\sqrt{x+5}}{x+2}$. Express your answer in interval notation.

33) Give that $f(x)=\dfrac{2x^2}{5x^2-9x-2}$. Find the $\lim\limits_{x\to\infty} f(x)$. Also state the Domain of the function.

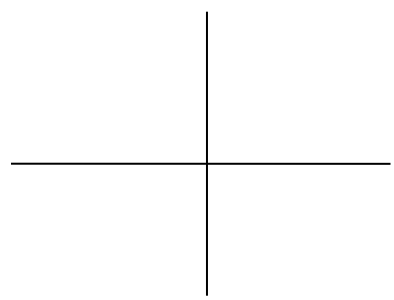
34) Use a graphing calculator to approximate all of the function's real zeros. Round your results to 3 decimal places. $f(x)=3x^6-5x^5-4x^3+x^2+x+1$

<u>BC ONLY</u>

35) Eliminate the parameter and state the endpoints of the parametric equation defined by
$x=t^2-3, \quad y=t+2, \quad -2\le t\le 2$ (BC ONLY)

36) Graph, and show direction for, the relation defined parametrically as (BC ONLY)

$x=t^2-5, \quad y=t-2, \quad -2\le t\le 3$



37) Determine whether the vectors $\langle 2,-1\rangle$ and $\langle -2,-5\rangle$ are orthogonal. (BC ONLY)

38) Find the angle between vector $u=\langle -2,5\rangle$ and vector $v=\langle -1,3\rangle$. (BC ONLY)

39) Find the equivalent rectangular equation and graph. (BC ONLY)

$$x = t - 3, \quad y = \frac{2}{t}$$

40) State the smallest interval $(0 \le \theta \le k)$ that gives the complete graph of the polar equation $r = 4\cos(5\theta)$ (BC ONLY)

41) The graph of the polar equation $r = 5\sin(3\theta)$ is a... (BC ONLY)

A. 3 petal rose, starting at the polar axes

B. 3 petal rose, starting in the 1^{st} quadrant

C. 6 petal rose, starting at the polar axes

D. 6 petal rose, starting in the 1^{st} quadrant