Name _____

Summer Work for Calculus AB
Part 1

Dear Students,

   I hope you are all having a wonderful and relaxing summer.

   The attached questions are designed to guide you through the first six sections of the textbook. These questions should cover topics that you have seen in class for two (possibly more) years now, and you should feel pretty comfortable with them. Please complete your work in the space provided in this packet and remember to work in pencil. If your answer is a long decimal, you may round your answer to three decimal places. I will be collecting all four parts of this packet on the first day of class, and your packets will be graded based on your effort. We will spend time in the first week of school reviewing this packet. As you work your way through this packet, you will notice that I have outlined the pages in your textbook that correspond to each group of questions. Use your textbook as your first reference should you have a question. If any question is still unclear, please e-mail me at nick.viglucci@woosterschool.org.

   Have a great summer, and I will see you all soon!

Please box all answers

Basic questions from Section 1.1 (Page 3 in your textbook)

1. Write an equation for (a) the vertical line and (b) the horizontal line through the point (5, -3).

2. Write an equation in both point-slope and slope-intercept forms for the line through (-5, 9) and (7, 6)

3. Find the value of j for which the line through (j, 13) and (2, -8) has a slope of -9.

4. For what value of k are the two lines $5x + ky = 8$ and $x - y = 1$

   (a) Parallel?

   (b) Perpendicular?

5. Use the following data to answer the questions below

Number of Members of the Senior Class in the Student Center	Number of Underclassman in the Student Center
2	17
7	12
14	5
20	0

(a) Find a linear regression equation for the data

(b) Find the slope of the regression line. What does the slope represent?

(c) Use the regression model to predict how many underclassmen will be in the Student Center if there are 10 seniors from last year in attendance.

(d) Use the regression model to predict how many seniors from last year would be in the Student Center if there are 3 Underclassman in attendance.

Some slightly harder questions from Section 1.1

6. Write an equation in both point-slope and slope-intercept forms for the line through $(2a, b - 3)$ and (a, b)

7. Find the value of j and k for which the line through the points $(j, 5)$ and $(3, k)$ has a slope of 2 and a y-intercept of 7.

8. Consider the circle of radius 10 centered at the origin. Find an equation of the line tangent to the circle at the point $(6, 8)$

Please box all answers

Basic questions from Section 1.2 (Page 12 in the textbook)
9. Solve for x. Write your answer using interval notation

$5x - 1 > 3x + 9$

10. Describe how the graph of $f(x)$ can be transformed to the graph of $g(x)$

$f(x) = |x|$ $\qquad\qquad$ $g(x) = 3|x + 4| - 12$

11. Use interval notation to identify the domain and range of the function

$f(x) = 5x^2 - 15x$

12. Use interval notation to identify the domain and range of the function

$f(x) = 3 + \sqrt{x + 4}$

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Summer Work for Calculus AB
Part 2

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Basic questions from Section 1.2 (Page 12 in the textbook)
13. Use interval notation to identify the domain and range of the function (hint: you'll need unions)

$$f(x) = \frac{1}{6 - 3x}$$

14. Use interval notation to identify the domain and range of the function

$$f(x) = x^{\frac{3}{4}}$$

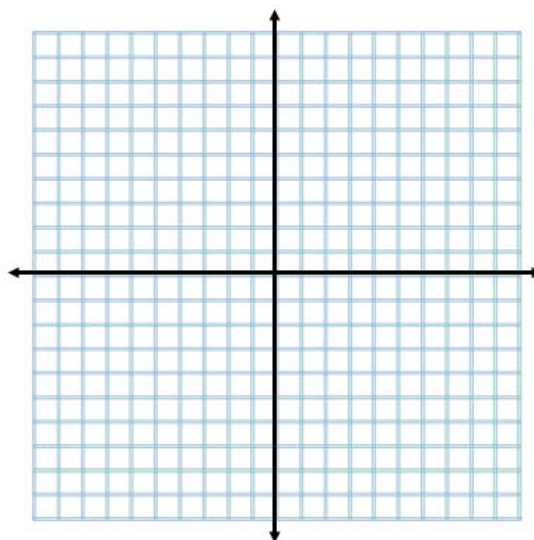15. Determine whether the function is odd, even, or neither. Explain how you arrived at your answer.

$$f(x) = x^2 - 6x + 9$$

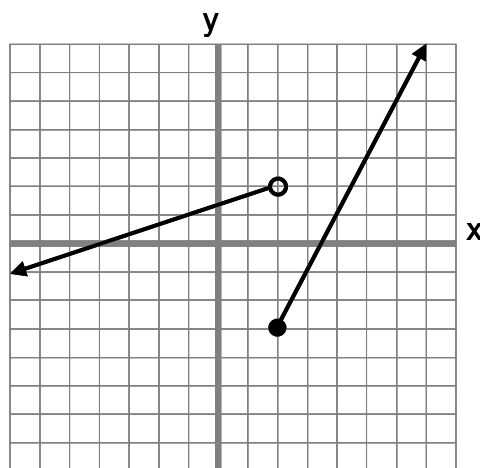16. Determine whether the function is odd, even, or neither. Explain how you arrived at your answer.

$$f(x) = \cos^2 x$$

17. Graph this piecewise-defined function

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

18. Write a piecewise formula for the function graphed

Please box all answers

Use the following functions to answer questions 19-20
$$f(x) = x^2 \qquad g(x) = 2x + 1 \qquad h(x) = |x|$$

19. Find $f(h(g(-13)))$

20. Find $f(g(x))$

Harder questions from Section 1.2

21. Solve for x using interval notation (a little B.T.V. might go a long way)

$$x^2 - 5x < 14$$

Use the following functions to answer questions 23-24

$$f(x) = x^2 \qquad g(x) = 2x + 1 \qquad h(x) = |x|$$

22. Solve for x

$$g(f(x)) = 101$$

24. Solve for x

$$g(f(x)) = f(g(x))$$

25. The product of two odd <u>numbers</u> is always odd. What can be said about the product of two odd <u>functions</u>? Give examples to support your statement.

**Basic questions from Section 1.3 (Page 22 in your textbook)**

26. The population of the town of Berlin in the year 2005 is 4,000. Assume the population increased at a rate of 3.4% per year.

(a) Estimate the population in 2015

(b) Approximate when the population will reach 12,000. (Solve this graphically or algebraically)

27. The half-life of the radioactive isotope einsteinium-252 is about 472 days. There are 100 grams present initially.
(a) Express the amount of einsteinium-252 remaining as a function of time t.

472 days later
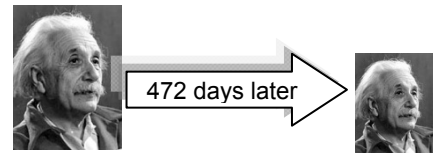
(b) Approximately when will there be 10 grams remaining?

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Summer Work for Calculus AB
Part 3

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Please box all answers

Basic questions from Section 1.4 (Page 30 in your textbook)

28. Find a parameterization for the line segment with endpoints (-3, 4) and (5, 1).

29. Find a parameterization for the line segment with endpoints (1, 11) and (3, 33).

30. Find a parameterization for upper half of the parabola: $x - 1 = y^2$.

Basic questions from Section 1.5 (Page 44 in your textbook)

31. The book definition of a one-to-one function is:

A function $f(x)$ is one-to-one on a domain D if $f(a) \neq f(b)$ whenever a $\neq$ b

Give a definition of a one-to-one function in somewhat plainer English:

32. Find the inverse function $f^{-1}(x)$ for the given function

$$f(x) = \frac{3}{x-2}$$

33. Find the inverse function $f^{-1}(x)$ for the given function (this might be a little tricky – note that the quadratic function is a perfect binomial square)

$$f(x) = x^2 + 20x + 100$$

34. Solve algebraically.

$(4.5)^x = 40$

35. Solve algebraically.

$e^{0.5t} = 10$

36. Solve algebraically.

$\ln(x) = 3.5$

Somewhat harder questions from Section 1.5

37. Solve algebraically.

$3^x = 2^{x+1}$

38. Solve for y in terms of x

$\ln(y + 1) - \ln 3 = x + \ln x$

Name _____

Summer Work for Calculus AB
Part 4

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Please box all answers

Basic questions from Section 1.6 (Page 46 in your textbook)
Please note: Answer these questions without a calculator and then use your calculator to check your answers.
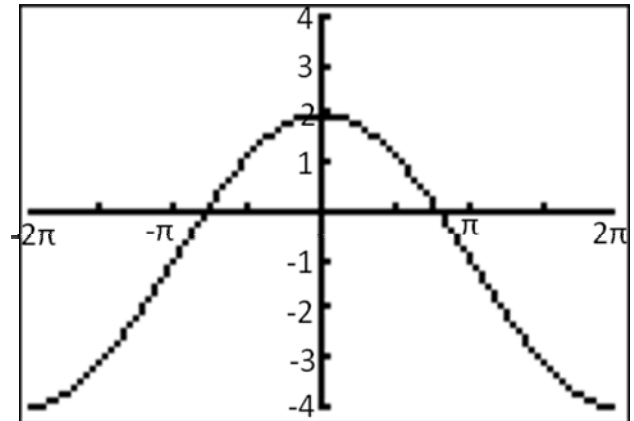39. Find the period, domain, and range of the following function:

$$y = 3\cos(2x) - 4$$

40. Find the period, domain, and range of the following function:

$$y = 3\csc\left(\frac{x}{2}\right)$$

41. Identify the following trigonometric function.

Somewhat harder questions from Section 1.6
42. Solve the following equation for the specified interval.

$$\sqrt[3]{\frac{16}{\sec(x)}} = -2 \quad \text{for} \quad [0, 2\pi]$$

Beyond Chapter 1

43. Jason would like to ride his bike to the park. For the first 3 minutes, he rides 10 miles per hour, then he gets tired and slows down to 5 miles per hour for the next 5 minutes. After he realizes he is going to be late, he speeds up to 15 miles per hour for the last 2 minutes until he arrives. Graph Jason's velocity vs time for his 10 minute trip.

44. Using the information provided in question 43 above, graph Jason's distance vs. time for his 10 minute trip. Will this be the same graph? Why? How are they related, if at all?

45. How far did Jason travel in problem 43 above? How did you arrive at your answer?

46. What were the three most difficult problems for you in this entire packet (Parts 1-4)?

You are done!
Congratulations!
Enjoy the rest of your summer, and I look forward to seeing you in September!
- Mrs. Barter