AP Calculus AB Summer Assignment 2020-2021

Dear Future Calculus Student,

       I hope you are excited for the year of Calculus that we will be pursuing together! We will be having a ton of fun -- and doing a lot of work-- learning everything there is to know about the mathematics of motion.

       Calculus can be described as the "mathematics of change" -- how fast things change, how to predict change, and how to use information about change to understand different systems themselves. In many ways, Calculus will simply extend what you already know about math one-step further.

       In order to give you a head start in the understanding of Calculus, I've designed a few things for you to do. The purpose of this assignment is to have you practice the prerequisite skills necessary to be successful in Calculus AB. All of the skills covered in this pack are skills learned in Algebra 2 and Pre-Calculus.

       If you need to, you may use reference materials to assist you and refresh your memory but keep in mind you must have this material mastered. Most of this assignment should be completed without the use of a calculator.

       I hope that these problems help you maintain and improve your skills so we can hit the ground running from day one. AP Calculus AB is a fast-paced course that is taught at the college level. There is a lot of material in the curriculum that must be covered before the AP exam in May. Therefore, we cannot spend a lot of class time re-teaching prerequisite skills. This is why you have this assignment. Try your best to complete it on your own. It would be in your best interest to not copy others or cheat.

       Try to pace the assignment over the entirety of the summer to maintain the skills needed to do well in the course. This assignment is due on the first day of school! It will be counted as your first test grade of the marking period. You must hand in a separate sheet of paper with your work neatly numbered so it can be easily identified.

       If you have major difficulties in doing this assignment or if you think it is too long, perhaps you should consider attending the optional intensive summer workshops. If you have any questions, do not hesitate to email me (agallo@longbranch.k12.nj.us), text me (732-962-4878), or post a questions (Google Classroom: 7bjhr6k) over the course of the summer.

       Most importantly, I hope you have a wonderful summer and best of luck on this assignment. I look forward to working with each one of you next year.

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See you in September!

~ Ms. Gallo

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Before beginning the online version of the assignment, you should have the assignment open in Google Chrome. You will need to add the extension, EquatIO. Follow the steps in this video: https://www.youtube.com/watch?v=Vo3ah8tNJJw

You may complete the summer assignment on paper but you must also submit your answers through the Google Form. Here is the link to assignment as a Google Form: https://docs.google.com/forms/d/e/1FAIpQLSdbSIo-Zt8We4V16FPNJ2f1braNRV_LWCQdCIAFjA2rdJfnYQ/viewform?usp=sf_link

Name: _____

Simplify the following:

1. $\dfrac{3}{4x^2-25} + \dfrac{2}{2x+5}$

2. $\dfrac{8}{y-2} - \dfrac{3y}{2y^2-8}$

3. $\dfrac{30x^2+53x+22}{70x^2+17x-66}$

Let $f(x) = 2x + 1$ and $g(x) = 2x^2 - 1$. **Find each.**

4. $f(2)$

5. $g(-3)$

6. $f(h + 1)$

7. $f[g(-2)]$

8. $g[f(m + 2)]$

9. $[f(x)]^2 - 2g(x)$

Let $f(x) = \sin(2x)$. **Find each EXACT value.**

10. $f\left(\frac{\pi}{4}\right)$

11. $f\left(\frac{2\pi}{3}\right)$

12. $f\left(-\frac{\pi}{6}\right)$

Let $f(x) = x^2$, $g(x) = 2x + 5$, and $h(x) = x^2 - 1$. **Find each.**

13. $h[f(-2)]$

14. $f[g(x-1)]$

15. $g[h(x^3)]$

Find the x and y intercepts for each of the following functions:

16. $y = 2x - 5$

17. $y = x^2 + x - 2$

18. $y = x\sqrt{16 - x^2}$

19. $y^2 = x^3 - 4x$

Find the point(s) of intersection of the graphs for the given equations.

20. $\begin{array}{l} x+y=8 \\ 4x-y=7 \end{array}$

21. $\begin{array}{l} x^2+y=6 \\ x+y=4 \end{array}$

22. $\begin{array}{l} x=3-y^2 \\ y=x-1 \end{array}$

Find the domain and range of the following functions. Write your answers in INTERVAL NOTATION.

23. $f(x) = x^2 - 5$

24. $f(x) = -\sqrt{x+3}$

25. $f(x) = 3\sin x$

26. $f(x) = \frac{2}{x-1}$

Find the inverse for each function.

27. $f(x) = 2x + 1$

28. $f(x) = \frac{x^2}{3}$

29. $g(x) = \frac{5}{x-2}$

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

31. If the graph of $f(x)$ has the point $(2, 7)$ then what is one point that will be on the graph of $f^{-1}(x)$?

32. Explain, in words, how the graphs of $f(x)$ and $f^{-1}(x)$ compare.

33. Determine the equation of a line passing through the point $(5, -3)$ with an undefined slope.

34. Determine the equation of a line passing through the point $(4, -2)$ with a slope of 0.

35. Use point-slope form to find the equation of the line passing through the point $(0, 5)$ with a slope of 2/3.

36. Use point-slope form to find a line passing through the point $(2, 8)$ and parallel to the line $y = \frac{5}{6}x - 1$

37. Use point-slope form to find a line perpendicular to $y = -2x + 9$ passing through the point $(4, 7)$.

38. Find the equation of a line passing through the points (-3, 6) and (1, 2).

39. Find the equation of a line with an x-intercept of (2, 0) and a y-intercept of (0, 3).

Determine the exact value of the following. DO NOT use a calculator.

40. $\sin \pi$

41. $\cos \dfrac{3\pi}{2}$

42. $\sin \left(-\dfrac{\pi}{2}\right)$

43. $\sin \left(\dfrac{5\pi}{4}\right)$

44. $\cos \dfrac{\pi}{4}$

45. $\cos(-\pi)$

46. $\cos \left(\dfrac{\pi}{3}\right)$

47. $\sin \dfrac{5\pi}{6}$

48. $\cos \dfrac{2\pi}{3}$

49. $\tan \left(\dfrac{\pi}{4}\right)$

50. $\tan \pi$

51. $\tan \left(\dfrac{\pi}{3}\right)$

52. $\cos \dfrac{4\pi}{3}$

53. $\sin \dfrac{11\pi}{6}$

54. $\tan \dfrac{7\pi}{4}$

55. $\sin \left(-\dfrac{\pi}{6}\right)$

Solve each of the equations for $0 \leq x \leq 2\pi$.

56. $\sin x = -\frac{1}{2}$

57. $2 \cos x = \sqrt{3}$

58. $4 \sin^2 x = 3$

*Recall $sin^2 x = (\sin x)^2$

59. $2 \sin^2 x - 3 \sin x - 2 = 0$

60. $\cos^2 x = 1 - \sin x$

61. $\sin x - 2 \sin x \cos x = 0$

62. Given $f(x) = x^2$ and $g(x) = (x - 3)^2 + 1$, how does the graph of $g(x)$ differ from $f(x)$ in terms of transformations of functions?

63. Write an equation for the function that has the shape of $f(x) = x^3$ but moved six units to the left and reflected over the x-axis.

Find the vertical asymptotes for the following functions:

64. $f(x) = \frac{1}{x^2}$

65. $f(x) = \frac{x^2}{x^2-4}$

66. $f(x) = \frac{2+x}{x^2(1-x)}$

67. $f(x) = \frac{4-x}{x^2-16}$

68. $f(x) = \frac{x-1}{x^2+x-2}$

69. $f(x) = \frac{5x+20}{x^2-16}$

Find the horizontal asymptotes for the following functions:

70. $f(x) = \frac{x^2-2x+1}{x^3+x-7}$

71. $f(x) = \frac{5x^3-2x+8}{4x-3x^3+5}$

72. $\frac{4x^2}{3x^2-7}$

73. $f(x) = \frac{(2x-5)^2}{x^2-x}$

74. $f(x) = \frac{-3x+1}{\sqrt{x^2+x}}$

***Remember $\sqrt{x^2} = \pm x$

Solve the following equations to find the value of x.

75. $3^{3x-5} = 9^{2x+1}$

76. $\left(\frac{1}{9}\right)^x = 27^{2x+4}$

77. $\left(\frac{1}{6}\right)^x = 216$

Evaluate the following logarithms. Use the exponential definition of a logarithm to help you.

78. $\log_7 7$

79. $\log_3 27$

80. $\log_2 \frac{1}{32}$

81. $\log_{25} 5$

82. $\log_9 1$

83. $\log_4 8$

84. $\ln \sqrt{e}$

85. $\ln \frac{1}{e}$

86. $\ln 0$

Solve each logarithmic or exponential equation below. Give exact answers.

87. $\log_{20}(8 - 2x) = \log_{20}(-3x + 10)$

88. $5 \ln(b - 9) = 20$

89. $3 \log_4(4n - 5) + 4 = 7$

90. $\log(x + 21) + \log x = 2$

91. $5^{2x} = 20$

92. $4 - 2e^{x+1} = -12$

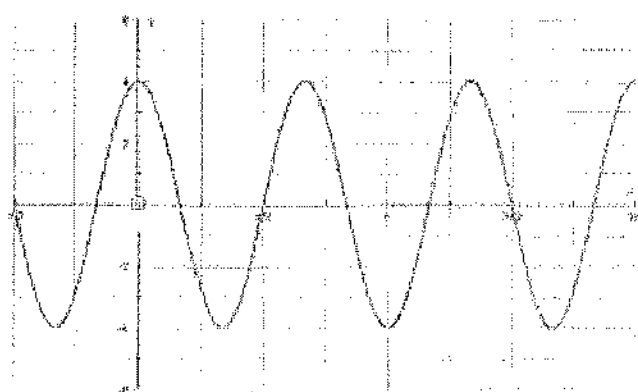**State whether the following functions are even, odd, or neither. Show your work to explain your answer.**

93. $y = 2x^4 - 5x^2$
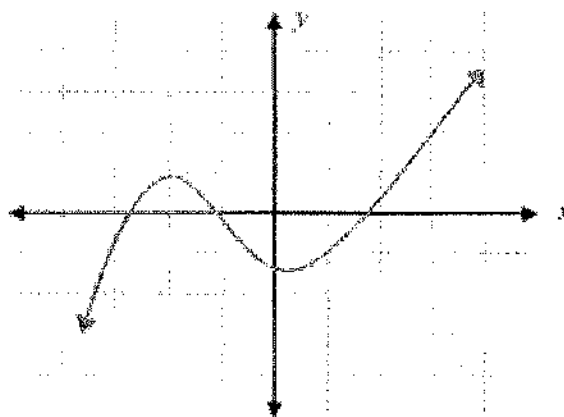
94. $g(x) = x^5 - 3x^3 + x$

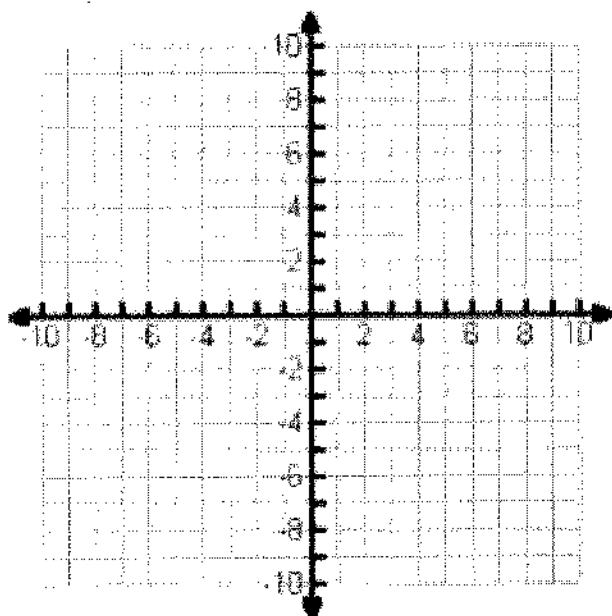95. $h(x) = 2x^2 - 5x + 3$

96. $f(x) = 2 \cos x$

97.

98.

Graph each of the following piecewise functions. Determine any points of discontinuity.

99. $f(x) = \begin{cases} x + 5; & x \le 2 \\ -4; & x > 2 \end{cases}$

100. $f(x) = \begin{cases} x - 1; & x \le -2 \\ 2x - 1; & -2 < x \le 4 \\ -3x + 8; & x > 4 \end{cases}$