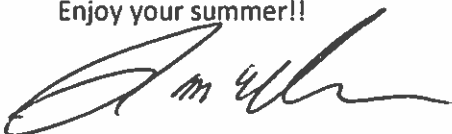


## AP Calculus Summer Assignment Instructions

- Review of Algebra, Geometry & Trigonometry Worksheet Packet
  - Going into AP Calculus, there are certain math skills necessary in order to be successful for the year and ultimately on the AP exam. This assignment has been designed for you to review/relearn/learn those topics so that you will be ready to learn calculus. I have included websites to refer to if you need help.
  
- Help sites:
  1. Most Algebra Topics: <http://www.purplemath.com/modules/index.htm>
  2. Trigonometry: <http://math.com/homeworkhelp/Trigonometry.html>
  3. Khan Academy: <https://www.khanacademy.org>
  
  4. <http://patrickimt.com>
  
- For this packet, you must show all of your work (on separate sheets if necessary) and do not rely on a calculator to do all of the work for you. Half of the AP exam does not allow any calculator at all.
  - This will count as your first test grade of MP 1.
  - Do not wait until the last minute to complete this assignment. If you complete 10-15 problems per week, you will be finished by the end of the summer.
  - I will be in the building until July 30th teaching summer school. If you have any questions, feel free to stop by. You can also e-mail me at school.
  - [rmcwilliams@gcsd.k12.nj.us](mailto:rmcwilliams@gcsd.k12.nj.us)

I am looking forward to a great year next year!

Enjoy your summer!!



Mr. McWilliams

Complete the following. Show all work in the packet in a clear manner in order to receive full credit. Have this assignment completed and ready to turn in on the first day of school. No calculator except where noted.

1 – 6] Expand the following expressions completely using properties of logarithms.

1)  $\log_2 4x^2$

2)  $\ln\left(\frac{3+x}{4}\right)$

3)  $\ln \sqrt{e^x}$

4)  $\ln \sqrt{\frac{7x^2}{5-2x}}$

5)  $\log_6(6x^3y^4)$

6)  $\ln\left(\frac{(x+3)^3}{4x}\right)^{-2}$

7 – 16] Factor each of the following completely.

7)  $a^2 - b^2$

8)  $a^3 - b^3$

9)  $8x^3 + y^3$

10)  $4x^2 - 21x - 18$

11)  $2x^2 + x - 3$

12)  $3x^2 + 6x^3 - 9x$

13)  $(x + 1)^3(4x - 9) - (16x + 9)(x + 1)^2$

14)  $(x - 1)^3(2x - 3) - (2x + 12)(x - 1)^3$

15)  $(2x - 1)^3(x - 3) + (x + 1)(2x - 1)^3$

16) Factor  $x - a$  in such a way that  $\sqrt{x} - \sqrt{a}$  is a factor.

17 – 24] Simplify.

$$17) \frac{\frac{x}{2}}{\frac{x}{4}}$$

$$18) h \div \frac{x+h}{h}$$

$$19) \frac{\sqrt{x-2} + \frac{5}{\sqrt{x-2}}}{x-2}$$

$$20) \frac{x(5x+1) - 3(x^2+1)}{(x-1)^2}$$

$$21) \frac{(x+1)^3(4x-9) - (16x+9)(x+1)^2}{(x-6)(x+1)^3}$$

$$22) \frac{3x(x+1) - 2(2x+1)}{(x-1)^2}$$

$$23) \frac{2x(x+1)^2 - 3(x+1)^3}{8x^3 + 30x^2 + 18x}$$

$$24) \frac{(x-1)^3(2x-3) - (4x-1)(x-1)^3}{(x-1)^2(2x-1)}$$

**25 – 28] Solve the equation for x.**

25)  $4x^2 - 21x - 18 = 0$

26)  $x^3 + 3x^2 - 5x - 15 = 0$

27)  $x^4 - 9x^2 + 8 = 0$

28)  $4 - 3^x = 0$

29) Write as a single fraction with denominator in factored form:  $\frac{7x^2 + 5x}{x^2 + 1} - \frac{5x}{x^2 - 6} = 0$ .

30) Using your graphing calculator, graph the equation  $y = x^3 - x$  and answer the following questions.

- a) Is the point (3,2) on the graph?
- b) Is the point (2,6) on the graph?
- c) Is the function even, odd, or neither?
- d) What is the y-intercept?
- e) Find the x-intercepts.

31) Find all intercepts of the graph of  $y = \frac{x-1}{x+3}$ .

**32 - 35] Show work to determine if the relation is even, odd, or neither.**

32)  $f(x) = 2x^2 - 7$

33)  $f(x) = -4x^3 - 2x$

34)  $f(x) = 4x^2 - 4x + 4$

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

36) Find the equation of the line that passes through the point (2,4) and is parallel to the line  $2x + 3y - 8 = 0$ .

37) Find the equation of the line that is perpendicular to the line  $2x + 3y - 8 = 0$  at the point (1,2).

38) The line with a slope of 5 that passes through the point  $(-1,3)$  intersects the x-axis at a point. What are the coordinates of this point?

39) What are the coordinates of the point at which the line passing through the points  $(1,-3)$  and  $(-2,3)$  intersects the y-axis?

40) Given that  $f(x) = |x - 3| - 5$ , find  $f(1) - f(5)$ .

41) Find all points of intersection of the graphs of  $x^2 + 3x - y = 3$  and  $x + y = 2$ .

42) If the point  $(-1,1)$  lies on the graph of the equation  $kx^2 - xy + y^2 = 5$ , find the value of  $k$ .

43) Write the equation of a graph that is a function.

44) Write the equation of a graph that is not a function.

45 – 48] Find the domain of each of the following functions.

$$45) h(x) = \frac{6}{4x^2 - 21x - 16}$$

$$46) k(x) = \sqrt{x^2 - 5x - 14}$$

$$47) p(x) = \frac{\sqrt[3]{x-6}}{\sqrt{x^2 - x - 30}}$$

$$48) y = \ln(2x - 12)$$

49) For the function, find the domain, range, and determine whether the function is odd, even, or neither.

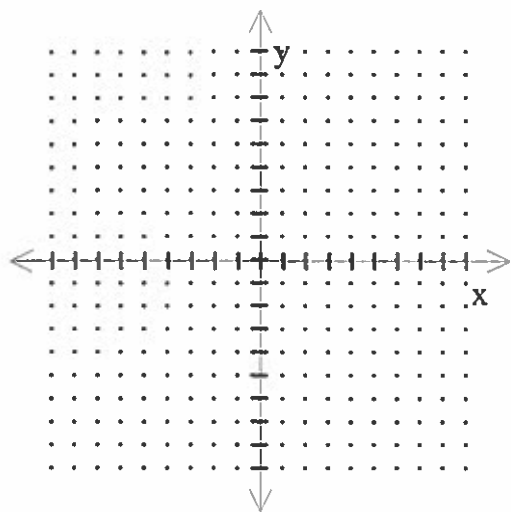
$$y = 5 - \sqrt{9 - x^2}$$

50) For the function, find the domain and range.  $f(x) = \begin{cases} -\frac{1}{2}x & x < -2 \\ \sqrt{x+2} & x \geq -2 \end{cases}$

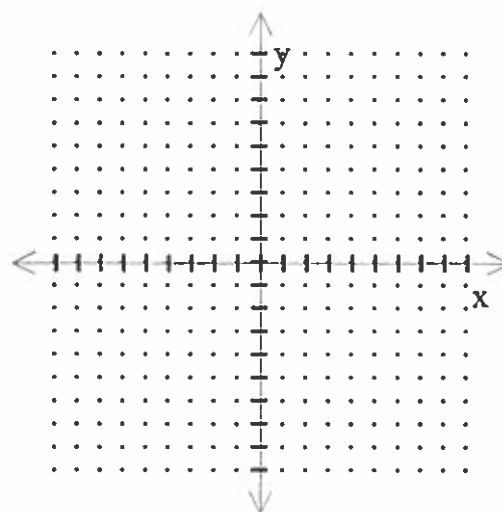
51) Find  $f(x + h)$  for  $f(x) = x^2 - 2x - 3$ .

52 - 53] Sketch the graph of each function.

$$52) f(x) = \begin{cases} 1 & x \leq 0 \\ -1 & x > 0 \end{cases}$$



$$53) g(x) = \begin{cases} 2x, & x < -1 \\ 2x^2, & -1 \leq x < 2 \\ -x+3, & x > 2 \end{cases}$$



54) State the domain, range, and intercepts of the function  $y = 2^{-x} - 1$ .

55 - 57] Given  $f(x) = x - 3$  and  $g(x) = \sqrt{x}$  complete the following.

55)  $f(g(x))$

56)  $g(f(x))$

57)  $f(f(x))$



58 - 60] Given  $f(x) = \frac{1}{x-5}$  and  $g(x) = x^2 - 5$  complete the following.

58)  $f(g(7))$

59)  $g(f(v))$

60)  $g(g(x))$

61-66] Evaluate the following without a calculator.

61)  $\ln 1$

62)  $\ln e$

63)  $\ln \sqrt{e}$

64)  $\log_2 \frac{1}{8}$

65)  $\ln 0$

66)  $\ln \frac{1}{e^2}$

67) Find the area of the region bounded by  $y = \sqrt{36 - x^2}$  and the x-axis.

68) Find the area of the region bounded by  $y=2x$ , the x-axis, and  $x=4$ .

**69 - 83] Evaluate the trigonometric functions without a calculator.**

69)  $\cos\left(\frac{5\pi}{6}\right)$

70)  $\sin\left(\frac{19\pi}{6}\right)$

71)  $\sec\left(\frac{3\pi}{2}\right)$

72)  $\sec\left(\frac{2\pi}{3}\right)$

73)  $\cot(11\pi)$

74)  $\csc\left(\frac{13\pi}{4}\right)$

75)  $\sin\left(\frac{19\pi}{3}\right)$

76)  $\tan(-21\pi)$

77)  $\csc\left(\frac{-11\pi}{6}\right)$

78)  $\sin\left(\frac{-3\pi}{4}\right)$

79)  $\tan\left(\frac{3\pi}{2}\right)$

80)  $\tan\left(\frac{7\pi}{4}\right)$

81)  $\cos\left(\frac{5\pi}{4}\right)$

82)  $\sec\left(\frac{7\pi}{6}\right)$

83)  $\cot\left(\frac{3\pi}{2}\right)$

**84-86] Find the solution(s) to the equations on  $[0, 2\pi]$ .**

84)  $2\sin^2\theta = 1 - \sin\theta$

85)  $2\tan\theta - \sec^2\theta = 0$

86)  $\cos^2(\theta) + \sin\theta = 1$

87) Circle the two expressions that are equivalent.

a)  $\cos^2(x)$

b)  $(\cos x)^2$

c)  $\cos x^2$

88) Circle the two expressions that are equivalent.

a)  $(\sin x)^{-1}$

b)  $\arcsin(x)$

c)  $\sin x^{-1}$

d)  $1/\sin(x)$

**89-97] Evaluate the expression without using a calculator. Express your answer in radians.**

$$89) \cos^{-1}(-1) =$$

$$90) \tan^{-1}\left(\frac{\sqrt{3}}{3}\right) =$$

$$91) \sin^{-1}(0) =$$

$$92) \sin^{-1}\left(-\frac{\sqrt{2}}{2}\right) =$$

$$93) \tan^{-1}(1) =$$

$$94) \cos^{-1}\left(\frac{\sqrt{3}}{2}\right) =$$

$$95) \cos^{-1}\left(-\frac{1}{2}\right) =$$

$$96) \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) =$$

$$97) \tan^{-1}(\sqrt{3}) =$$

**98-104] Solve for x.**

$$98) \ln e^3 = x$$

$$99) \ln e^x = 4$$

$$100) \ln(x) + \ln(x) = 0$$

$$101) e^{\ln 5} = x$$

$$102) \ln(1) - \ln(e) = x$$

$$103) \ln(6) + \ln(x) - \ln(2) = 3$$

$$104) \ln(x + 5) = \ln(x - 1) - \ln(x + 1)$$