# AP Calculus
# Summer Take Home Assignment

The following problems must be completed this summer and turned in to me the first day of class. This will count as your first 10 homework assignments for the year. It will be graded based on completion and effort.

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Directions:
All work must be completed in pencil, **on separate paper**, showing work neatly under each problem. Circle/label final answers. Twenty points per day will be deducted for late assignments. **No calculators** may be used.
If you have any questions about the test during the summer, please email me at geletkanycze@region18.org

There are certain skills that have been taught to you over the previous years that are essential towards your success in AP Calculus. If you do not have these skills, you will find that you will consistently get problems incorrect next year, even though you may understand the calculus concepts. It is frustrating for students when they are tripped up by the algebra or trigonometry and not the calculus. This summer packet is intended for you to retain/review/relearn these topics. **There will be a TEST on this material the second day of class.**

Below is a list of several websites that may help you when you come across a difficult problem. If you are unsure of how to attempt these problems, please look online for help. If you need to ask a question, please send me an e-mail - geletkanycze@region18.org. Feel free to use all resources available to you via textbooks. I would also like to encourage you to work with your classmates. Please take these problems seriously. You should try to complete a few problems each day, as if it was a daily journal. I suggest you do not wait and do it a week before we start school in August.

A.P. Calculus teacher: Mrs. Geletkanycz

**Helpful Websites**
http://www.math.com/
http://www.mathtv.com/
http://archives.math.utk.edu/visual.calculus/

***Simplify using only positive exponents.***

1. $-3^{-x}$

2. $-5\left(\frac{3}{2}\right)(4-9x)^{-1/2}(-9)$

3. $(2)\left(\frac{2}{(2-x)}\right)\left[\frac{-2}{(2-x)}\right]$

4. $\left(16x^2y\right)^{3/4}$

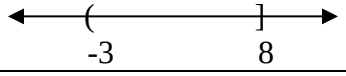
5. $\sin(x^{-1/2})$

6. $\frac{\sqrt{4x-16}}{\sqrt[4]{(x-4)^3}}$

7. $\frac{\frac{1}{2}(2x+5)^{-3/2}}{\frac{3}{2}}$

8. $\left(\frac{1}{x^{-2}}+\frac{4}{x^{-1}y^{-1}}+\frac{1}{y^{-2}}\right)^{-1/2}$

Interval Notation. Complete the table

| Algebraic | Interval | Graph |
|---|---|---|
| $-1 \le x$ | | |
| | $[-5,3)$ | |
| | |   |

***Find the domain of the following functions. Make sure to use interval notation (ex: [0, 3)).***

9. $y=\log(2x-12)$

10. $y=\frac{x^2-4}{2x+4}$

11. $y=\frac{x^2-5x-6}{x^2-3x-18}$

12. $y=\frac{2^{2-x}}{x}$

13. $y=\sqrt{x-3}-\sqrt{x+3}$

14. $y=\frac{\sqrt{2x-9}}{2x+9}$

15. $y=\frac{x^2+8x+12}{\sqrt[4]{x+5}}$

16. $y=\sqrt{\tan x}$

17. $y=\sqrt{x^2-5x-14}$

18. $y=\frac{3x-2}{4x+1}$

19. $y=\frac{\sqrt[3]{x-6}}{\sqrt{x^2-x-30}}$

20. $y=\frac{x}{\cos x}$

***Factor completely.***

21. $x^5+11x^3-80x$

22. $(x-3)^2(2x+1)^3+(x-3)^3(2x+1)^2$

23. $2x^2+50y^2-20xy$

***Solve the following inequalities by factoring and making sign charts.***

24. $x^2-16>0$

25. $x^2+6x-16>0$

26. $x^2-3x\le 10$

27. $2x^2+5x\le 3$

28. $x^3+4x^2-x\ge 4$

29. $2\sin^2 x\ge \sin x$

***Describe, in words, the transformations that would take place to*** $f(x)$ ***in each of the following.***

30. $f(x)-4$

31. $f(x-4)$

32. $-f(x+2)$

33. $5f(x)+3$

34. $f(2x)$

35. $|f(x)|$

***Determine if each function is even, odd, or neither. Show all work.***

36. $f(x)=2x^2-7$

37. $f(x)=-4x^3-2x$

38. $f(x)=4x^2-4x+4$

39. $f(x)=x-\dfrac{1}{x}$

***Solve each equation by factoring, graphing, or using the quadratic formula.***

40. $7x^2-3x=0$

41. $4x(x-2)-5x(x-1)=2$

42. $x^2+6x+4=0$

43. $2x^2-3x+3=0$

44. $2x^2-(x+2)(x-3)=12$

45. $x+\dfrac{1}{x}=\dfrac{13}{6}$

46. $x^4-9x^2+8=0$

47. $x-10\sqrt{x}+9=0$

48. $\dfrac{1}{x^2}-\dfrac{1}{x}=6$

***Find the equations of all vertical (x = ?), horizontal (y = ?) or oblique asymptotes (if they exist).***

49. $y = \dfrac{x}{x-3}$

50. $y = \dfrac{x+4}{x^2-1}$

51. $y = \dfrac{x^3+4}{x^2+1}$

52. $y = \dfrac{x^2-9}{x^3+3x^2-18x}$

53. $y = \dfrac{2x^3}{x^3-1}$

54. $y = \dfrac{\sqrt{x}}{2x^2-10}$

***Simplify the following.***

55. $\dfrac{x}{x-\frac{1}{2}}$

56. $\dfrac{\frac{1}{x}+4}{\frac{1}{x}-2}$

57. $\dfrac{x-\frac{1}{x}}{x+\frac{1}{x}}$

58. $\dfrac{\frac{x^2-y^2}{xy}}{\frac{x+y}{y}}$

59. $\dfrac{x^{-3}-x}{x^{-2}-1}$

60. $\dfrac{\frac{x}{1-x}+\frac{1+x}{x}}{\frac{1-x}{x}+\frac{x}{1+x}}$

***If*** $f(x)=x^2$, $g(x)=2x-1$, and $h(x)=2^x$***, find the following.***

61. $f(g(2))$

62. $g(f(2))$

63. $f(h(-1))$

64. $g\left(f\left(h\left(\frac{1}{2}\right)\right)\right)$

***Solve each equation.***

65. $\dfrac{2}{3}-\dfrac{5}{6}=\dfrac{1}{x}$

66. $x+\dfrac{6}{x}=5$

67. $\dfrac{x+1}{3}-\dfrac{x-1}{2}=1$

68. $\dfrac{2}{x+5}+\dfrac{1}{x-5}=\dfrac{16}{x^2-25}$

69. $\dfrac{60}{x}-\dfrac{60}{x-5}=\dfrac{2}{x}$

70. $\dfrac{x-5}{x+1}=\dfrac{3}{5}$

***Solve each equation on the interval*** $[0, 2\pi)$. ***Give exact values*** $\left(\text{ex: } \frac{\pi}{3}\right)$ ***if possible.***

71. $\sin x = \frac{1}{2}$

72. $\cos^2 x = \cos x$

73. $2\cos x + \sqrt{3} = 0$

74. $4\sin^2 x = 1$

75. $2\sin^2 x + \sin x = 1$

76. $\cos^2 x + 2\cos x = 3$

77. $2\sin x \cos x + \sin x = 0$

78. $8\cos^2 x - 2\cos x = 1$

79. $\sin^2 x - \cos^2 x = 0$

***Answer the following questions over a variety of topics.***

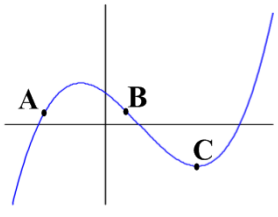
80. Let $f$ be a linear function where $f(2) = -5$ and $f(-3) = 1$. Find $f(x)$.

81. Find an equation for the line, in point-slope form, that contains $(5,1)$ and is perpendicular to $6x - 3y = 2$.

82. Use the table to calculate the average rate of change from $t = 1$ to $t = 4$.

| $t$ | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| $x(t)$ | 8 | 7 | 5 | 1 | 2 |

83. Order the points A, B, and C, from least to greatest, by their rates of change.



84. Find the distance between the points $(8,-1)$ and $(-4,-6)$.

85. If $g(x)=\dfrac{x}{x+3}$, find $g^{-1}(x)$ (*the inverse of g*).

86. Find the points of intersection in the graphs of $y=x-1$ and $y^2=2x+6$.

87. Rewrite $\dfrac{1}{2}\ln(x-3)+\ln(x+2)-6\ln x$ as a single logarithmic expression.

88. Evaluate the following. ( no calculator)

a) $\sin\left(\dfrac{7\pi}{6}\right)$ b) $\csc(60°)$ c) $\cos(120°)$

d) $\sec\left(-\dfrac{2\pi}{3}\right)$ e) $\tan\left(\dfrac{\pi}{2}\right)$ f) $\cot(-135°)$

89. Sketch a graph of the piecewise function $f(x)=\begin{cases} x^2-5, & x<-1 \\ 0, & x=-1 \\ 6-4x, & x>-1 \end{cases}$.

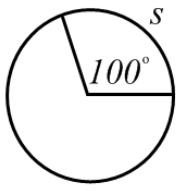
90. Describe the left and right end-behavior of the function $f(x)=-3^x$.

91. Find the domain and range of each function (without a calculator if possible).

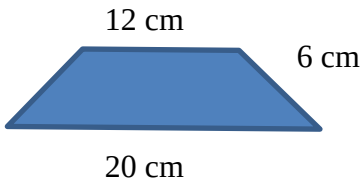
a) $f(x)=(x-3)^2+2$ b) $f(x)=2|x-4|-3$ c) $f(x)=\sqrt[3]{1-x}$

d) $f(x)=5\sin x$ e) $f(x)=\tan\left(x-\dfrac{\pi}{4}\right)$ f) $f(x)=e^{-x}$

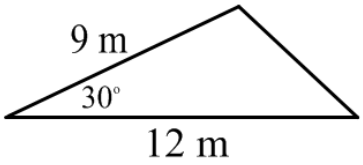
92. The circle below has a radius of 6 ft. Find the area and circumference of the circle, then find *s*.



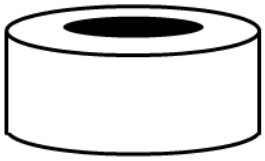

93. Find the area of the trapezoid.




94. Find the missing sides and angles of the triangle. Then find its area.

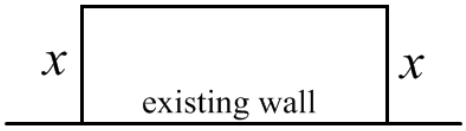



95. Find the volume of a washer with outer radius of 18 ft., inner radius of 15 ft., and height of 3 ft.



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

97. Three sides of a fence and an existing wall form a rectangular enclosure. The total length of fence used for the three sides is 240 ft. Find $x$ if the area enclosed is 5500 ft$^2$.




98. 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?
b) When will the number of elk be 750?
c) What is the maximum number of elk possible in the park?

99. Simplify $\csc x - \tan x \sin x \cos x$.

100.Use long division, or synthetic division, to rewrite the expression $\frac{x^3-7x^2+14x-8}{x-4}$.

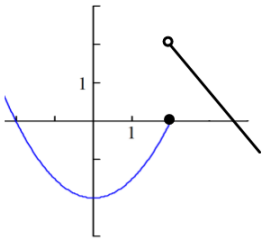
101.Rewrite $y=-3x^2-24x+11$ in vertex form $\left((x-k)^2+h\right)$ by completing the square.

102.Sketch a graph of the piecewise function $f(x)=\begin{cases}-x^2, & -2\le x<1\\ -2, & x=1\\ 3x+5, & 1<x\le 3\end{cases}$.

103.Use a graphing calculator to solve $e^{2x}=3x^2$.

104.Do the lines $-x+5y=22$ and $7x-2y=19$ intersect? ( show work)

105.The function $f(x)$ is graphed below. Find the following.




a) $f(2)$ b) $f(0)$ c) $f(x)=0$