AP Calculus AB Summer Review Packet

TO: All 2017/2018 AP Calculus AB Students

FROM: AP Calculus AB Teacher
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We are pleased that you have chosen to complete your math sequence by enrolling in AP Calculus AB for next year. To help ensure your success in AP Calculus AB next year, we have created a summer review work packet. This packet contains material that you must have knowledge of on the 1st day of the course. The packet has questions from your previous math courses.

**********There will be a quiz on these topics within the first days of school.**********

This packet is to be completed in the following manner:

- Work must be clearly enumerated and in consecutive order on separate paper.
- Each problem with work counts toward the total grade.
- Each problem must have WORK! **NO WORK! NO CREDIT!**
- **The packet with work is due on the first FULL day of school.** NO EXCUSES will be accepted.
- **The packet is due whether or not you are physically present in school.** NO EXCUSES will be accepted.

Resources you may want to use:
- Your notes from previous math courses
- *Calculus: Graphical, Numerical, Algebraic*, Third Edition, Finney, Demana, Waits & Kennedy
- www.interactmath.com
- college.hmco.com/mathematics/larson/calculus_analytic/7e/students/index.html
- college.hmco.com/mathematics/resources/students/ace/college_algebra/ace.html
- mathforum.org
- khanacademy.org
- mathkanection.com
- Practice the Unit Circle at: www.kwarp.com/portfolio/trigspinner.html

Below is a list of supplies you will NEED for AP Calculus. Shop for the items when they are on sale and be prepared the first day of school. AP Calculus is a college-level course and you are expected to be prepared with your materials each day.

***AP Calculus Supplies Needed*:**
Pencils/Erasers
Binder
Paper
Graphing Calculator (TI-84 Plus or Silver Edition, TI-Nspire, or TI-Nspire CX)

********** YOU MUST HAVE A GRAPHING CALCULATOR **********
********** EVERY DAY, IN CLASS AND AT HOME **********

MORTON EAST HIGH SCHOOL

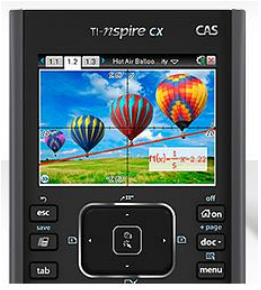
Math Department

Graphing calculators are an integral part of Pre-Calculus and AP Calculus. You have already learned how to operate a graphing calculator in Pre-Calculus and will continue to use this valuable technology during AP Calculus at Morton East and throughout your math courses in college.

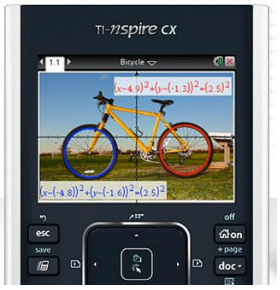
You are required to use a graphing calculator for the AP Calculus exam. If you already have a TI-Nspire or TI-84, you are already prepared.

If you don't have one yet, the Texas Instrument TI-NSpire CX is the suggested graphing calculator. An alternative graphing calculator would be the TI-84. Calculators can be purchased at local stores or online.

Notice: The TI-Nspire CAS (CAS stands for Computer Algebra System) and TI-89 *ARE NOT* allowed for the ACT, but are allowed for the SAT & AP exam.



Permitted on SAT & AP Exam



Permitted on ACT & AP Exam

Thank You,

AP Calculus Teachers

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AP Calculus AB Summer Review Packet

This packet is a review of information you learned in previous math courses which is needed to be successful in AP Calculus AB. Therefore, this packet is due on your **FIRST DAY IN CALCULUS**. It is to be completed CORRECTLY, NEATLY, and on a SEPARATE sheet of paper.

Your Calculus teacher will collect your work on your **FIRST DAY IN CALCULUS**. Failure to turn in your completed work on your **FIRST DAY IN CALCULUS** may jeopardize your ability to remain in the course.
(The problems that warrant the use of a graphing calculator are indicated with a .)

Trigonometry

I. Without using a calculator, determine the exact value of each expression. YOU ARE EXPECTED KNOW THE UNIT CIRCLE! Practice at: www.kwarp.com/portfolio/trigspinner.html

1. $\sin \pi$ **2.** $\cos \frac{\pi}{4}$ **3.** $\tan \frac{5\pi}{6}$ **4.** $\sec \frac{4\pi}{3}$ **5.** $\sin^{-1}\left(\tan \frac{3\pi}{4}\right)$

II. Trigonometric Identities

6. Write the 3 Pythagorean Identities **7.** Write the 3 double angle identities for cosine: $\cos 2x = ?$

8. Write the double-angle identity for sine: $\sin 2x = ?$

III. Simplify.

9. $\frac{\sin 2x}{\sin x}$ **10.** $\sin^2 x + \cot^2 x \sin^2 x$ **11.** $\csc x - \cos^2 x \csc x$ **12.** $\frac{\sin^2 x + \sin x - 6}{\sin x + 3}$

IV. Solve.

13. Solve for *m*: $m \cos x + m \sin x = \cos 2x$ **14.** Solve for *x*: $\cos x - \sin x = 0,\ 0 \le x \le \frac{\pi}{2}$

15. Solve for *x*: $\cos 2x = \sin x, -\frac{\pi}{2} \le x \le \frac{\pi}{2}$ **16.** Solve for *x*: $\sec^2 x - \tan^2 x = \sin x,\ -\frac{\pi}{2} \le x \le \frac{\pi}{2}$

Solving & Simplifying Equations

I. Solve for *m.*

17. $2x + 8ym = 0$ **18.** $m = (y + xm)(1 + y)$

II. Solve for *x*, where *x* is a real number. Show the work that leads to your solution.

19. $x^2 - 7 = 2x + 8$ **20.** $\frac{4x^2 - 9}{x} = 0$ **21.** $(x + 3)^2 = 16$ **22.** $3x^2 + 10x = 8$

23. $(x + 3)^2(x - 1) + (x + 3)(x - 1)^2 = 0$

III. Simplify each expression.

24. $\frac{2x^2 - x - 3}{x + 1}$ **25.** $\frac{x^2 - 5x + 4}{x^2 - 2x - 8}$ **26.** $\frac{x^2 + 3x}{9 - x^2}$ **27.** $\frac{\frac{1}{x}}{\frac{1}{x^2 + 2x}}$ **28.** $\frac{x + 1}{8x} \cdot \frac{4}{x^2 + 3x + 2}$

29. $\frac{1}{x} - \frac{1}{x + 2}$ **30.** $\frac{2x}{x - 1} + \frac{4}{x^2 - 4x + 3}$ **31.** $\frac{\frac{1}{x + 2} - \frac{1}{2}}{x}$ **32.** $27^{2/3}$ **33.** $-4^{3/2}$

34. $\frac{8x^2y^{-1}}{2x^{-5}y}$ **35.** $(4x^{-5}yz^2)^0$ **36.** $(8x^{-3}y^3z^6)^{1/3}$ **37.** $(x^3y^{-1})(x^4y^2)$ **38.** $\ln 1$

39. $\ln 0$ **40.** $\ln e^2$ **41.** $e^{\ln 5}$ **42.** $e^{\ln 4+\ln 7}$ **43.** $e^{2\ln 3}$

44. $e^{\ln 4-\ln 3}$ **45.** $\log_5 25$ **46.** $\log_5\left(\frac{1}{5}\right)$ **47.** $\log_5\left(\sqrt[3]{5}\right)$

IV. Solve for *x*, where *x* is a real number. Show the work that leads to your solution.

48. $e^{2x} = 5$ **49.** $e^{3x} = -2$ **50.** $\ln 3x = -2$ **51.** $\log_2(x+3) + \log_2 x = 2$

Miscellaneous

I. Follow the directions for each problem. Show all computations that lead to your answer.

52. Given $f(x) = e^{-x}$, find $f(\ln 3)$.

53. Given $f(x) = \frac{1}{x} - \frac{1}{x+2}$, find $f(3)$.

54. Given $f(x) = 2|x-1| + 5$, find $f(0) - f(3)$.

55. Given $f(x) = x^2 + 2x - 3$, find $f(x+4) - f(4)$.

56. Find $f(x+h)$ for $f(x) = 2x^2 + 3x - 1$.

57. Find $\frac{f(x+h)-f(x)}{h}$ for $f(x) = x^2 + 3x - 2$.

58. Given $h(x) = f(x) - g(x)$, $f(x) = x + \frac{1}{x+1}$, and $g(x) = \frac{1}{x} + 2x$, find $h(2)$.

59. Let $f(x) = \begin{cases} 2x+7, & x < 2 \\ -x^2, & x \geq 2 \end{cases}$. Find $f(-3)$ and $f(5)$.

60. Let $f(x) = \begin{cases} x^{3/2}, & 0 \leq x < 5 \\ \ln 2x, & x \geq 5 \end{cases}$. Find $f(4)$ and $f(e^3)$.

61. Given $f(x) = 3x - 6$ and $g(x) = x^2 - 4$, find $f(x)g(x)$, $\frac{f(x)}{g(x)}$, $(g \circ f)(x)$, and $(f \circ g)(x)$.

62. Given $f(x) = 3x - 6$, find $f^{-1}(x)$.

63. Find the *x*-intercept(s): $4x^2 - 3y^2 + 2xy - 12 = 0$

64. Find the *x*-intercept(s) for $f(x) = -e^x + 2$.

65. Using a graphing calculator, find all point(s) of intersection of the graphs of $y = x^3 - 2x^2 + x - 1$ and $y = -x^2 + 3x - 2$. Round your answer to the nearest thousandths.

66. If the point $\left(4, -\frac{1}{3}\right)$ lies on the graph of the equation $2x + cy = 11$, find the value of *c*.

67. A drainpipe can hold 50 cubic feet of water before overflowing. There is 30 cubic feet of water in the pipe at time $t = 0$, where t is measured in hours. The amount of water that flows into the pipe is represented by the function $R(t) = 20\sin\left(\frac{t}{25}\right)$ and the amount of water that drains out of the pipe is represented by the function $D(t) = -.01t^4 + 0.15t^3 + 0.48t^2$. Find the time, to the nearest thousandths, when the drainpipe overflows.

II. Using the point-slope form: $y - y_1 = m(x - x_1)$, write an equation for the line:

68. with slope -2, containing the point $(4,1)$

69. containing the points $(2,-3)$ and $(-5,6)$

70. parallel to $5x - 2y = 7$ and passing through $(3,2)$

71. perpendicular to the line $5x - 2y = 7$ and passing through $(3,2)$

Graphs & Limits

I. Use the given graph

72. Write the equation of the tangent line in point-slope form from the graph in Figure 1.

73. The graph in Figure 2 consists of line segments and a semi-circle. Find the area between the graph and the *x*-axis on the interval $-3 \le x \le 1$.

74. The graph in Figure 2 consists of line segments and a semi-circle. Find the area between the graph and the *x*-axis on the interval $-4 \le x \le 2$.

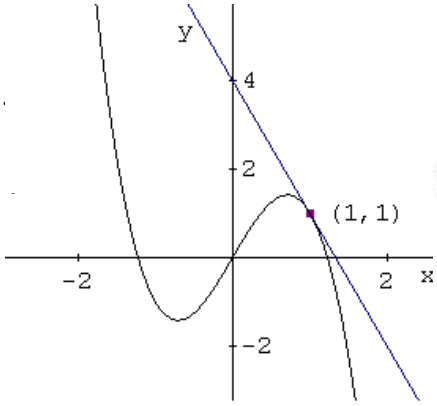


Figure 1

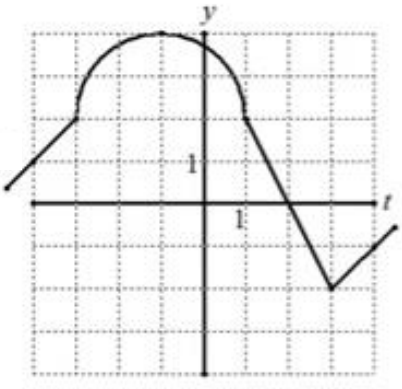


Figure 2

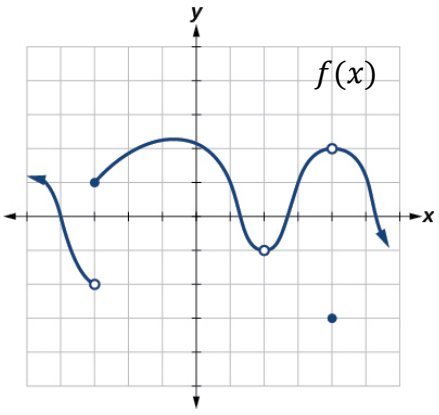
II. Identify the domain and range of the following equations.

(Keep in mind you should know your parent functions without a calculator.)

75. $y = x^3 - 2x^2 - 3x$ **76.** $y = x^2 + 3x - 10$ **77.** $y = e^x + 3$ **78.** $y = \ln(x - 1)$

79. $y = \sqrt{x+2} - 1$ **80.** $y = |x - 2| + 3$ **81.** $y = \frac{1}{x}$ **82.** $f(x) = \begin{cases} -x + 3 & x < 0 \\ x^2 - 1 & x \ge 0 \end{cases}$

III. Use the drawing to the right to find the each limit/value.



83. $\lim_{x\to -3^-} f(x)$ **84.** $\lim_{x\to -3^+} f(x)$ **85.** $\lim_{x\to -3} f(x)$ **86.** $f(-3)$

87. $\lim_{x\to 2^-} f(x)$ **88.** $\lim_{x\to 2^+} f(x)$ **89.** $\lim_{x\to 2} f(x)$ **90.** $f(2)$

91. $\lim_{x\to 4^-} f(x)$ **92.** $\lim_{x\to 4^+} f(x)$ **93.** $\lim_{x\to 4} f(x)$ **94.** $f(4)$

IV. Find the limits algebraically.

95. $f(x) = \begin{cases} -x + 3 & x < 0 \\ x^2 - 1 & x \ge 0 \end{cases}$. Find $\lim_{x\to 0^-} f(x)$, $\lim_{x\to 0^+} f(x)$, and $\lim_{x\to 0} f(x)$ algebraically.

96. Find $f(x) = 3x + 2$, $g(x) = \frac{x^2-3x+2}{x-1}$. Find $\lim_{x\to 1} f(x)$ and $\lim_{x\to 1} g(x)$ algebraically.

97. Find $\lim_{x\to -5} \frac{x+5}{\sqrt{x+9}-2}$ algebraically and numerically.