

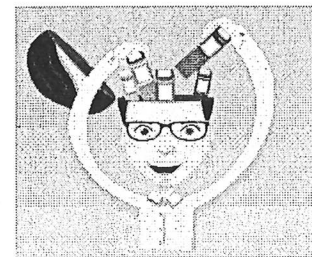
AP Calculus AB

Summer Packet

This packet is intended to prepare you for AP Calculus AB. You will review algebra and pre-calculus skills. It is due on the first day of school in August and will be worth homework points based on completion. The packet is a little lengthy so please do not wait until the last minute to get started. The first page has properties and concepts that will help you complete the packet. The 'library of functions' page should be filled out by you and kept in your "toolbox". The toolbox is a section of the three-ring binder you need for this course. I filled in the first two functions as an example. You should know what these functions should like and how they behave. You will also be required to have a TI 84 calculator. We will work hard in this class, but it will be worth it. Calculus is a fascinating course; I know you will love it as much as I do. Have a wonderful summer!

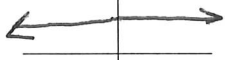
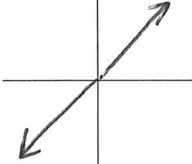
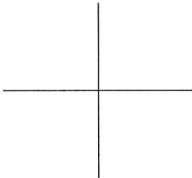
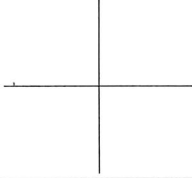
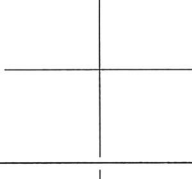
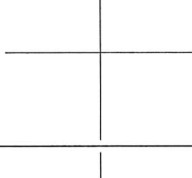
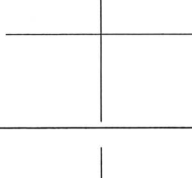
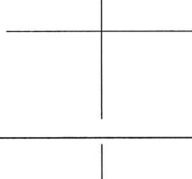
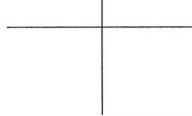
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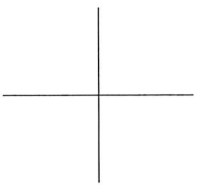
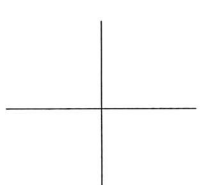
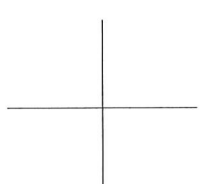
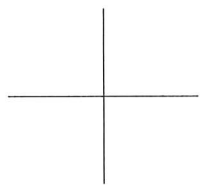
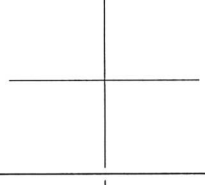
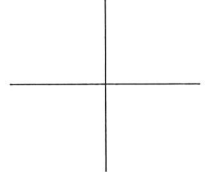
The following formulas and identities will help you complete this packet. You are expected to know ALL of these for the course.



<p>LINES</p> <p>Slope-intercept: $y = mx + b$</p> <p>Point-slope: $y - y_1 = m(x - x_1)$</p> <p>Standard: $Ax + By = C$</p> <p>Horizontal line: $y = b$ (slope = 0)</p> <p>Vertical line: $x = a$ (slope = undefined)</p> <p>Parallel \rightarrow same slope</p> <p>Perpendicular \rightarrow opposite reciprocal slopes</p>	<p>QUADRATICS</p> <p>Standard: $y = ax^2 + bx + c$</p> <p>Vertex: $y = a(x - h)^2 + k$</p> <p>Intercept: $y = a(x - p)(x - q)$</p> <p>Parabola opens: up if $a > 0$ down if $a < 0$</p> <p>Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$</p>
<p>EXPONENTIAL PROPERTIES</p> <p>$x^a \cdot x^b = x^{a+b}$ $(xy)^a = x^a y^a$</p> <p>$\frac{x^a}{x^b} = x^{a-b}$ $\sqrt[n]{x^m} = x^{m/n}$</p> <p>$x^0 = 1$ ($x \neq 0$) $\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$</p> <p>$x^{-n} = \frac{1}{x^n}$ In general, it is fine to have negative exponents in your answers!</p>	<p>LOGARITHMS</p> <p>$y = \log_a x$ is equivalent to $a^y = x$</p> <p>$\log_b(mn) = \log_b m + \log_b n$</p> <p>$\log_b\left(\frac{m}{n}\right) = \log_b m - \log_b n$</p> <p>$\log_b(m^p) = p \log_b m$</p>
<p>TRIGONOMETRIC IDENTITIES</p> <p>$\csc x = \frac{1}{\sin x}$ $\sec x = \frac{1}{\cos x}$ $\cot x = \frac{1}{\tan x}$ $\tan x = \frac{\sin x}{\cos x}$ $\cot x = \frac{\cos x}{\sin x}$</p> <p>$\sin^2 x + \cos^2 x = 1$ $\tan^2 x + 1 = \sec^2 x$ $1 + \cot^2 x = \csc^2 x$</p> <p>$\sin(2x) = 2 \sin x \cos x$ $\cos(2x) = \cos^2 x - \sin^2 x$ or $1 - 2 \sin^2 x$ or $2 \cos^2 x - 1$</p>	

Library of Functions

	Function	Graph	Domain (Set)	Domain (Int)	Range (Set)	Range (Int)
1	Constant $f(x) = a$		\mathbb{R}	$(-\infty, \infty)$	$y = a$	$[a]$
2	Identity $f(x) = x$		\mathbb{R}	$(-\infty, \infty)$	\mathbb{R}	$(-\infty, \infty)$
3	Absolute Value <hr/>					
4	Quadratic <hr/>					
5	Square Root <hr/>					
6	Reciprocal <hr/>					
7	Cubic <hr/>					
8	Cube Root <hr/>					
9	Greatest Integer <hr/>					

10	Reciprocal of a Square <hr/>					
11	Semicircle <hr/>					
12	Exponential Growth <hr/>					
13	Exponential Decay <hr/>					
14	Natural Logarithm <hr/>					
15	Sine <hr/>					
16	Cosine <hr/>					
17	Arctangent <hr/>					

Name: _____

AP Calculus AB Summer Assignment 2023

For #1-8, write an equation in point-slope form.

1. Containing (4, -1) with a slope of $\frac{1}{2}$
2. Crossing the x-axis at $x = -3$ and the y-axis at $y = 6$.
3. Containing the points (-6,-1) and (3, 2).
4. Passing through (5, -3) with an undefined slope.
5. Passing through (-4, 2) with a slope of 0.
6. Passing through (2, 8) and parallel to $y = \frac{5}{6}x - 1$.
7. Passing through (4, 7) and perpendicular to the y-axis.
8. Passing through (6, -7) and perpendicular to $y = -2x - 5$

For #9-13, solve each equation for x . Note that some will have a particular value but others will have a solution in terms of other variables.

9. $x^2 + 3x = 8x - 6$

10. $\frac{2x-5}{x+y} = 3-y$

11. $3xy + 6x - xz = 12$

12. $A = ax + bx$

13. $\frac{y+2}{4-x} = 4(2-z)$

For #14-18, solve each quadratic by factoring.

14. $x^2 - 4x - 12 = 0$

15. $x^2 - 6x + 9 = 0$

16. $x^2 - 36 = 0$

17. $9x^2 - 1 = 0$

18. $4x^2 + 4x + 1 = 0$

For #19-23, evaluate the following knowing that $f(x) = 5 - \frac{2x}{3}$ and $g(x) = \frac{1}{2}x^2 + 3x$.

19. $f\left(\frac{1}{2}\right)$

20. $g(-2)$

21. $f(1) + g(0)$

22. $f(0) \cdot g(0)$

23. $\frac{g(-6)}{f(-6)}$

For #24-29, use $f(x) = x^2 - 1$, $g(x) = 3x$ and $h(x) = 5 - x$ to find each composite function.

24. $f(g(x))$

25. $g(f(x))$

26. $f(f(4))$

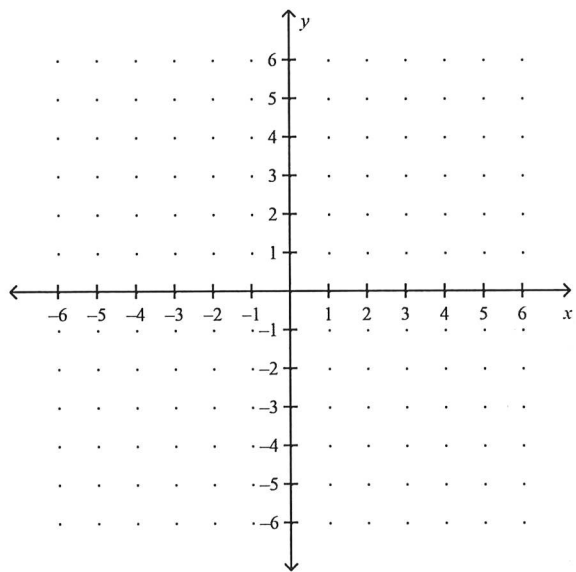
27. $g(h(-4))$

28. $f(g(h(1)))$

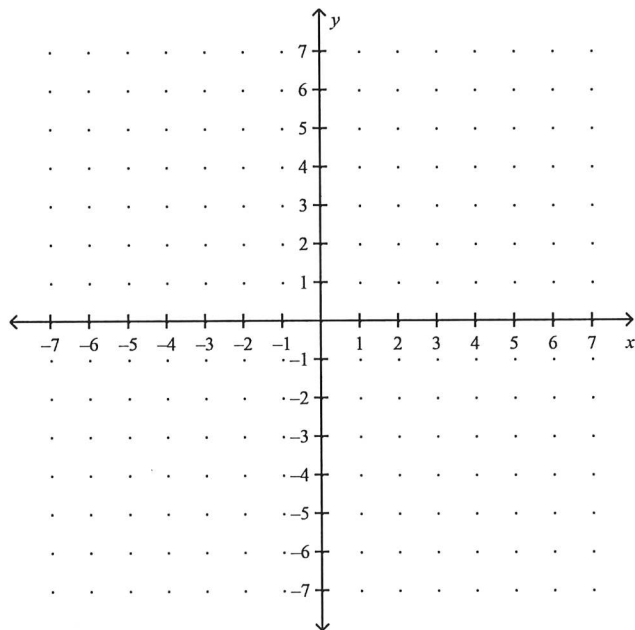
29. $g(f(x^3))$

For #30-31, graph each piecewise function.

30. $f(x) = \begin{cases} x+3; & x < 0 \\ -2x+5; & x \geq 0 \end{cases}$



$$31. f(x) = \begin{cases} \frac{1}{2}x; & -4 \leq x \leq 2 \\ 2x-3 & x > 2 \end{cases}$$



For #32-34, solve each exponential equation to the nearest thousandth.

$$32. 5^x = \frac{1}{5}$$

$$33. 6^x = 1296$$

$$34. 6^{2x-7} = 216$$

For #35-38, simplify each expression without the use of a calculator. The exponential properties on page two of this packet will help.

35. $e^{\ln 4}$

36. $e^{2\ln 3}$

37. $\ln e^9$

38. $5 \ln e^3$

For #39-43, solve each exponential or logarithmic equation by hand.

39. $e^x = 34$

40. $3e^x = 120$

41. $e^x - 8 = 51$

42. $\ln x = 2.5$

43. $\ln(3x - 2) = 2.8$

For #44-50, give the exact value of the expression using the unit circle.

44. $\cos\left(\frac{11\pi}{6}\right) =$

45. $\sin\left(\frac{-2\pi}{3}\right) =$

$$46. \tan\left(\frac{7\pi}{4}\right) =$$

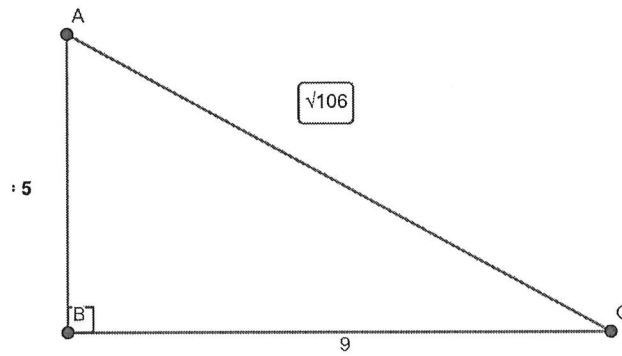
$$47. \csc\left(\frac{\pi}{4}\right) =$$

$$48. \cot\left(\frac{5\pi}{4}\right) =$$

$$49. \sec\left(\frac{-\pi}{4}\right) =$$

$$50. \tan\left(\frac{-4\pi}{3}\right) =$$

Evaluate each trig function using the right triangle provided. No need to rationalize the denominator.



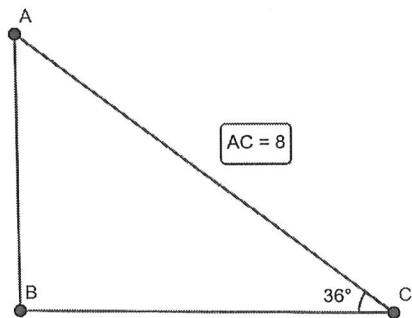
51. $\sin C =$

52. $\cos C =$

53. $\tan A =$

54. $\sec A =$

55. Solve the triangle, rounding all angles and sides to the nearest thousandth.



$m\angle A =$ _____

$AB =$ _____

$CB =$ _____

For #56-60, evaluate each inverse trig function using the unit circle. Write all answers in radians, not degrees. Do not use a calculator.

56. $\sin^{-1}\left(\frac{1}{2}\right) =$

57. $\sin^{-1}(-1) =$

58. $\arccos\left(\frac{-\sqrt{2}}{2}\right) =$

59. $\arctan(-1) =$

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

61. **Explain how the graph of $f(x)$ and its inverse, $f^{-1}(x)$, compare.**

For #62-64, find the inverse of each function.

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

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

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

For #65-74, find the domain and range of each function. Write answers in interval notation. Confirm your answers by graphing the function on your TI graphing calculator. The parent function paper will help you with this.

65. $f(x) = \sqrt{x+5}$

66. $g(x) = x^2 - 5$

67. $y(t) = \frac{1}{t+7}$

68. $h(x) = \frac{5}{x^2 + 1}$

69. $f(x) = \sqrt{x^2 + 5}$

70. $g(t) = t^3 + 2t - 7$

71. $h(x) = 3 \sin(\pi x) - 1$

72. $y(x) = \sqrt[5]{2x + 3}$

73. $f(x) = -3e^{2x} + 5$

74. $g(t) = \log_4(x - 2) + 1$

75. Consider the function $f(x) = \frac{e^x}{\log x - x^3}$.

a. Use your calculator to find the relative maximum and minimum of $f(x)$.

Min value = _____ max value = _____

b. State the domain of $f(x)$ in interval notation.

D: _____

c. State when the function is increasing and decreasing. Write in interval notation.

increasing _____ decreasing _____