AP CALCULUS BC
SUMMER HOMEWORK

This homework packet is due the first day of school. It will be turned in the first day of Calculus class and will count as a daily grade. You will take a test on the material in the packet during the first week of school.

Work these problems on notebook paper. All work must be shown.
Use your graphing calculator only on problems 44 - 55.

Find the x- and y-intercepts and the domain and range, and sketch the graph. No calculator.

1. $y = \sqrt{x-1}$
2. $y = \sqrt{9-x^2}$
3. $y = \dfrac{|x|}{x}$
4. $y = \sin x,\ -2\pi \le x \le 2\pi$
5. $y = \cos x,\ -2\pi \le x \le 2\pi$
6. $y = \tan x,\ -2\pi \le x \le 2\pi$
7. $y = \cot x,\ -2\pi \le x \le 2\pi$
8. $y = \sec x,\ -2\pi \le x \le 2\pi$
9. $y = \csc x,\ -2\pi \le x \le 2\pi$
10. $y = e^x$
11. $y = \ln x$
12. $y = \begin{cases} -1, & \text{if } x \le -1 \\ 3x+2, & \text{if } |x| < 1 \\ 7-2x, & \text{if } x \ge 1 \end{cases}$
13. $y = \begin{cases} x^2+1, & \text{if } x > 0 \\ -2x+2, & \text{if } x \le 0 \end{cases}$

Find the asymptotes (horizontal, vertical, and slant), symmetry, and intercepts, and sketch the graph. No calculator.

14. $y = \dfrac{1}{x-1}$
15. $y = \dfrac{1}{(x+2)^2}$
16. $y = \dfrac{2(x^2-9)}{x^2-4}$
17. $y = \dfrac{x^2-2x+4}{x-1}$

Solve. No calculator.

18. $x^2 - x - 12 > 0$
19. $(x-2)^2(x+1)^3(x-5) \le 0$
20. $\dfrac{3x-2}{x+4} \le 0$
21. $\dfrac{(2x+5)(x-1)^2}{(x+2)^3} \ge 0$

Evaluate. No calculator.

22. $\cos\dfrac{5\pi}{6}$
23. $\sin\dfrac{3\pi}{2}$
24. $\tan\dfrac{5\pi}{4}$
25. $\sin\dfrac{7\pi}{4}$
26. $\cos\pi$
27. $\tan\dfrac{2\pi}{3}$
28. $\sec\dfrac{4\pi}{3}$
29. $\csc\dfrac{\pi}{4}$
30. $\cot\dfrac{2\pi}{3}$

Evaluate. No calculator.

31. $\tan\left(\text{Cos}^{-1}\left(-\dfrac{\sqrt{3}}{2}\right)\right)$
32. $\sec\left(\text{Arc}\sin\left(-\dfrac{\sqrt{2}}{2}\right)\right)$
33. $\cos\left(\text{Sin}^{-1}(2x)\right)$
34. $\sec\left(\text{Arc}\tan(4x)\right)$

Solve. Give exact answers in radians, $0 \le x \le 2\pi$. No calculator.

35. $2\cos^2 x + 3\cos x - 2 = 0$

36. $2\sin^2 x - \cos x = 1$

37. $\sin(2x) = \cos x$

38. $2\cos(2x) + 1 = 0$

39. $2\csc^2 x + 3\csc x - 2 = 0$

40. $\tan^2 x - \sec x = 1$

41. $2\cos\left(\frac{x}{3}\right) - \sqrt{3} = 0$

42. $\tan(2x) = -\sqrt{3}$

43. $2\sin(3x) - \sqrt{3} = 0$

Solve. Show all steps. Use your calculator, and give decimal answers correct to **three** decimal places.

44. $e^{2x+3} = 37$

45. $e^{2x} - 5e^x + 6 = 0$

46. $e^x - 12e^{-x} - 1 = 0$

47. $\frac{50}{4 + e^{2x}} = 11$

58. $\log_4(x^2 - 3x) = 1$

49. $\ln(5x - 1) = 3$

50. $\log_2(x+3) + \log_2(x-1) = \log_2 12$

51. $\log_8(x+5) - \log_8(x-2) = 1$

52. $\log_6(\log_4(\log_2 x)) = 0$

53. $\log_3(\log_2(\log_5 25)) = x$

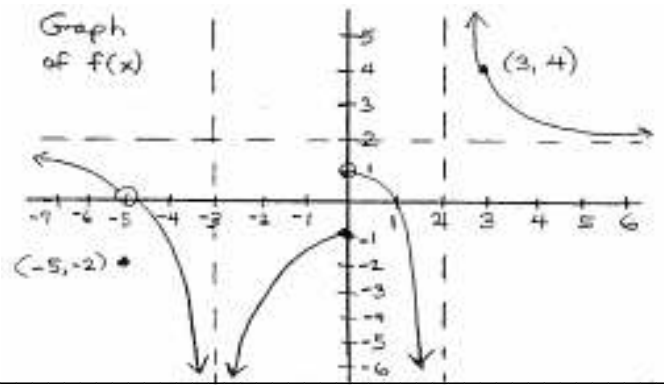
54. The number of students in a school infected with the flu t days after exposure is modeled by the function $P(t) = \frac{300}{1 + e^{4-t}}$.

(a) How many students were infected after three days?
(b) When will 100 students be infected?

55. Exponential growth is modeled by the function $n = n_0 e^{kt}$. A culture contains 500 bacteria when $t = 0$. After an hour, the number of bacteria is 1200.

(a) How many bacteria are there after four hours?
(b) After how many hours will there be 8000 bacteria?

Use the figure to find the limit. No calculator.



56. $\lim_{x \to 3} f(x)$

57. $\lim_{x \to \infty} f(x)$

58. $\lim_{x \to 2^+} f(x)$

59. $\lim_{x \to 0} f(x)$

60. $\lim_{x \to -\infty} f(x)$

61. $\lim_{x \to -5} f(x)$

Evaluate. Show supporting work for each problem (algebraic steps or sketch). No calculator.

62. $\lim_{x \to -3} \frac{x^2 + x - 6}{x + 3}$

63. $\lim_{x \to 0} \frac{(x-5)^2 - 25}{x}$

64. $\lim_{x \to 0} \frac{\sqrt{x+1} - 1}{x}$

65. $\lim_{x \to -6} \frac{x + 6}{x^2 + 3x - 18}$

66. $\lim_{x \to -2} \frac{x^3 + 8}{x + 2}$

67. $\lim_{x \to \infty} \frac{3x - 5x^2}{4x^2 + 1}$

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Evaluate. Show supporting work for each problem (algebraic steps or sketch). No calculator.

68. $\lim_{x\to 3^+} \frac{1}{x-3}$

69. $\lim_{x\to 3^-} \frac{1}{x-3}$

70. $\lim_{x\to 3} \frac{1}{x-3}$

71. $\lim_{x\to 3} \frac{1}{(x-3)^2}$

72. $\lim_{x\to 3^+} [\![x-1]\!]$

73. $\lim_{x\to 3^-} [\![x-1]\!]$

74. $f(x)=\begin{cases} 1-x, & x\le 1 \\ x^2, & x>1 \end{cases}$ (a) $\lim_{x\to 1^-} f(x)$ (b) $\lim_{x\to 1^+} f(x)$ (c) $\lim_{x\to 1} f(x)$

75. $f(x)=\begin{cases} \frac{x^2-x-6}{x-3} & \text{if } x\neq 3 \\ 4 & \text{if } x=3 \end{cases}$ (a) $\lim_{x\to 3} f(x)$ (b) $f(3)$

Use the **definition of the derivative** to find the derivative. No calculator.

$f'(x)=\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$. (You must **know** this formula.)

76. $f(x)=x^2-8x$

77. $f(x)=\sqrt{x+9}$

78. $f(x)=\frac{3}{x-4}$

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