West Essex Regional School District

Calculus Honors – Summer Assignment

2023 - 2024

Calculus Honors introduces the student to calculus of a single variable. The course is problem-driven in response to the calculus reform movement and integrates applications to management, life, and social science in exercises throughout the course. Functions are presented graphically, numerically and algebraically to give students the benefit of alternate interpretations. Graphing calculators will also be used extensively.
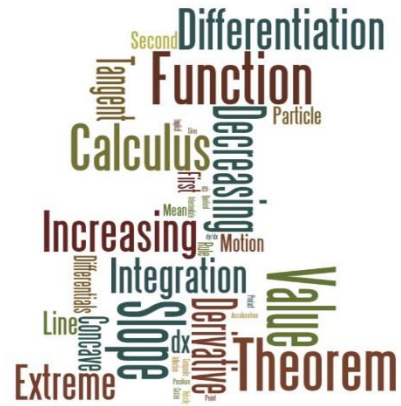
Course Goals

Students will be able to

- Work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal, and understand the connections among these representations.
- Understand the meaning of the derivative in terms of a rate of change and use derivatives to solve a variety of problems.
- Understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of change, and use integrals to solve a variety of problems.
- Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus
- Model a written description of a physical situation with a function or an integral.
- Understand the connections of calculus to other disciplines by solving application problems.
- Use technology to help solve problems, experiment, interpret results, and verify conclusions.
- Develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.

As stated above, the year must be devoted to topics in differential and integral calculus. Therefore, the summer assignments listed below are designed to help you review topics from algebra, geometry, and pre-calculus so that when you arrive in September, you are ready to begin with the first main theme to be covered this year.

- **All assignments will be collected the first week of school and be counted as 5 homework grades.**
- **Copies of the packet are also available on the teachers' websites.**
- **Please complete ALL work in pencil, and box in final answers where work is required to find them.**
- **Work should be completed during the weeks immediately preceding your return to school in September.**

Simplify

1. $\dfrac{x^2 - 4x - 12}{x^2 - 4}$

2. $\dfrac{x^3 - 27}{x - 3}$

3. $\dfrac{x - 5}{x^2 - 3x + 10}$

4. $\dfrac{4 - x}{x^2 - 16}$

5. $\dfrac{\dfrac{3}{4 + x} - \dfrac{3}{4}}{x}$

6. $\dfrac{2}{x + h} - \dfrac{2}{h}$

7. $\dfrac{2/x}{8/x^4}$

8. $(5a^3)(4a^2)$

9. $(4a^{5/3})^{3/2}$

10. $\dfrac{\dfrac{1}{2} - \dfrac{5}{4}}{\dfrac{3}{8}}$

11. $27^{2/3}$

12. $\dfrac{2x}{x^2-6x+9}-\dfrac{1}{x+1}-\dfrac{8}{x^2-2x-3}$

13. $(6a^{4/3})(2a^{3/2})$

14. $(4a^{5/2})^{3/2}$

15. $\dfrac{12x^{-3}y^2}{18xy^{-1}}$

16. $\dfrac{15x^2}{5\sqrt{x}}$

17. $\dfrac{3x^{-4}y^2}{15x^{-2}y}$

18. $8^{2/3}$

19. $\dfrac{\sqrt[3]{x^2}}{x}$

20. $x^{2/3}(x+x^{5/2}-x^2)$

21. $x^{1/3}(x^2 + x - x^{5/2})$	**22.** $e^{2\ln 5}$
23. $e^{(2 + \ln x)}$	**24.** $\ln e^7$
25. $\log_5(1/5)$	**26.** $\log_{1/2} 8$
27. $\ln \frac{1}{2}$	**28.** $e^{3\ln x}$
29. $\log_2 8$	**30.** $\log \dfrac{1}{100}$
31. $\ln e^{5x}$	**32.** $\ln 1$
33. e^0	**34.** $\sin^2 x + \cos^2 x$
35. $1 + \tan^2 x$	**36.** $\cot^2 x + 1$

Find the exact values without a calculator.

37. $\cos 0$	**38.** $\sin \dfrac{3\pi}{4}$	**39.** $\sec \dfrac{2\pi}{3}$	**40.** $\cos \dfrac{3\pi}{4}$
41. $\cot \dfrac{7\pi}{4}$	**42.** $\csc \dfrac{3\pi}{2}$	**43.** $\sin \pi$	**44.** $\cot \dfrac{2\pi}{3}$
45. $\tan \dfrac{11\pi}{6}$	**46.** $\sin \dfrac{\pi}{2}$	**47.** $\cos \pi$	**48.** $\cos \dfrac{7\pi}{6}$
49. $\cos \dfrac{\pi}{3}$	**50.** $\tan \dfrac{7\pi}{4}$	**51.** $\tan \dfrac{2\pi}{3}$	**52.** $\tan \dfrac{\pi}{2}$
53. $\sin(\cos^{-1} \frac{1}{2})$		**54.** $\cos^{-1}(\cos \dfrac{7\pi}{6})$	

55. Evaluate $\frac{f(x+h)-f(x)}{h}$ and simplify if $f(x) = 3x^2 - 4x$

56. Expand $(x + y)^3$

#57- 59 Find the intersection(s) of the equations.

57. $x^2 + y^2 = 25$ and $4x - 3y = 0$

58. $y = x^2 + 3x - 4$ and $y = 5x + 11$

59. $y = \cos x$ and $y = \sin x$ in the first quadrant

Solve for x.

60. $2x + 6xy = 0$

61. $2y^2 + 4yz - 5z - 4x = 0$

Solve.

62. $\dfrac{x^2 - 4}{x^4} = 0$

63. $2x^2 + 5x = 9$

64. $(x + 2)(x - 2) > 0$

65. $x^2 - 5x - 14 \leq 0$

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

67. $\sin 2x = \sin x, \ 0 \leq x \leq 2\pi$

68. $12x^2 = 4x$

69. $\sin(2x) = 1/2 \ , \ 0 \leq x \leq 2\pi$

70. $x^2 + 3x - 4 = 14$

71. $|x - 3| < 7$

72. $2x^2 + 5x = 3$

73. $3\sqrt{x - 2} - 8 = 8$

74. $(x-5)^2 = 9$	**75.** $12x^2 = 3$
76. $\log x + \log(x-3) = 1$	**77.** $(x+3)(x-3) > 0$
78. $27^{2x} = 9^{x-3}$	**79.** $4e^{2x} = 12$
#80-84 Write the equation of the line in slope-intercept form.	**80.** Slope -3, through point (2, 4)
81. Through points (0, -3) and (-5, 2)	**82.** Slope 0, through point (5, 1)
83. Parallel to line $2x - 3y = 7$ and through (5, 1)	**84.** Perpendicular to line $-3y + 6x = 2$ through point (4, 3)

85. Let f be linear function where $f(2) = -5$ and $f(-3) = 1$. State the function $f(x)$.

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

Graph.

87. $y = \sin x$
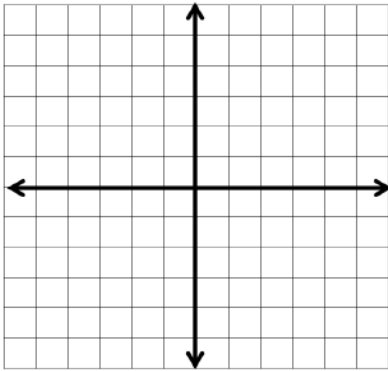
Domain _____

Range _____

88. $y = e^x$
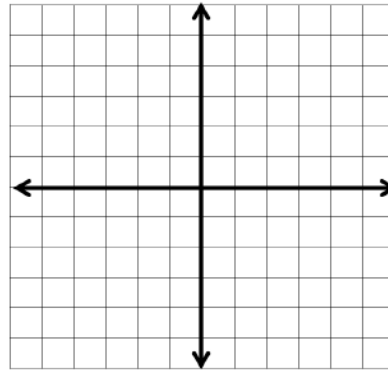
Domain _____

Range _____

89. $y = 2^x$
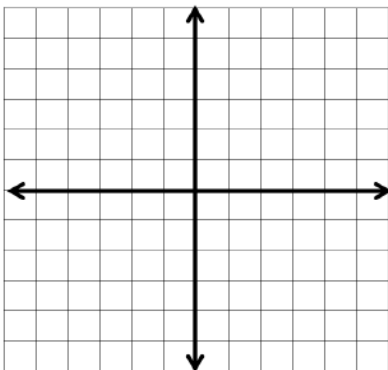
Domain _____

Range _____

90. $y = x^2 - 4$
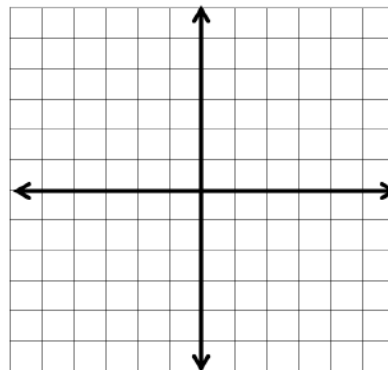
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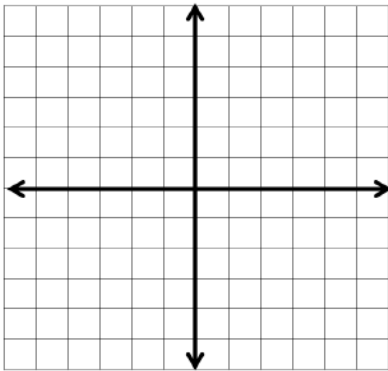
91. $y = |x + 3| - 2$
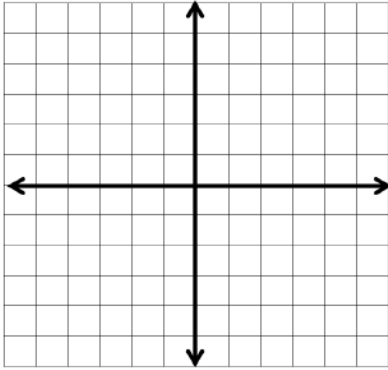
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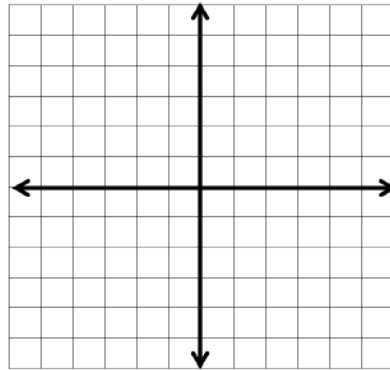
Range _____

92. $y = 1/x$
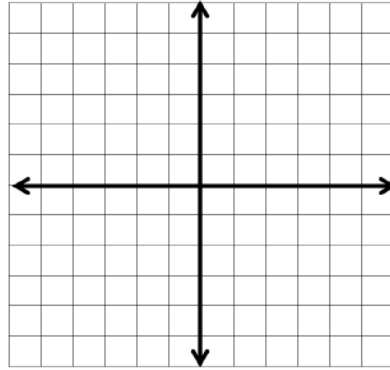
Domain _____

Range _____

93. $y = \sqrt{x}$

Domain _____

Range _____

94. $y = \sqrt[3]{x}$

Domain _____

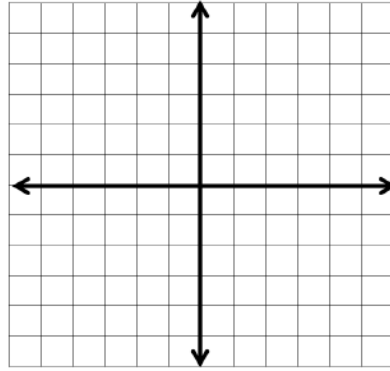Range _____

95. $y = \ln x$
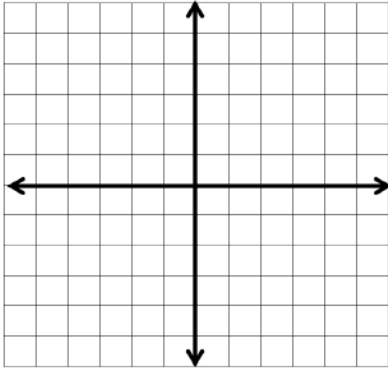
Domain _____

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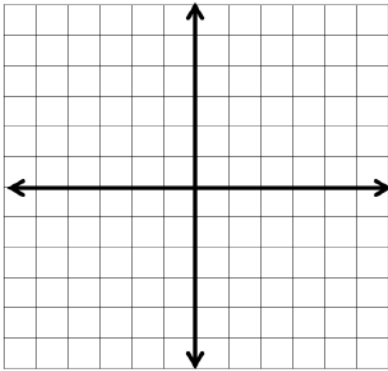
96. $y = \sqrt{4 - x^2}$

Domain _____

Range _____

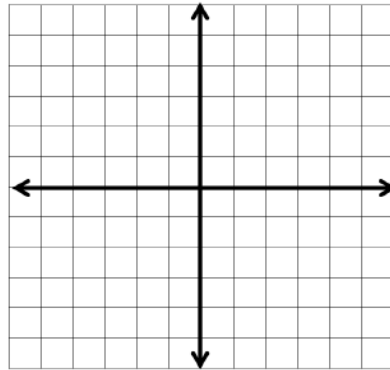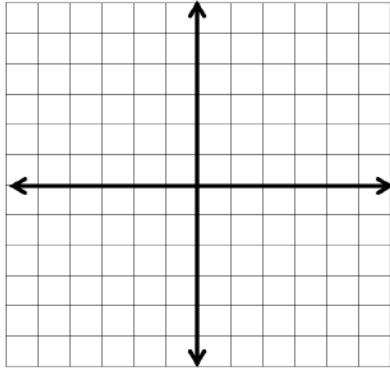**97.** $y = x^2 + 4x + 3$

Domain _____

Range _____
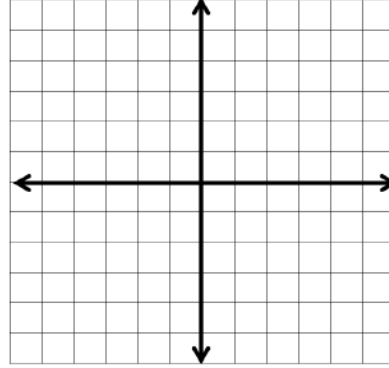
98. $y = \sqrt{x - 2}$

Domain _____

Range _____

99. $y = \begin{cases} x^2, & x < 0 \\ x + 2, & 0 \le x \le 3 \\ 4, & x > 3 \end{cases}$

Domain _____

Range _____

100. $y = \begin{cases} x^2 - 5, & x < -1 \\ 0, & x = -1 \\ 3 - 2x & x > -1 \end{cases}$

Domain _____

Range _____

#101-104 Given $f(x) = \dfrac{x}{x+3}$, $g(x) = \sqrt{x-3}$, $h(x) = x^2 + 5$, find:

101. $h(g(x))$

102. $f(g(2))$

103. $f(f(3))$

104. $h^{-1}(x)$