



Summer Mathematics Prep documents provide self-directed student review, practice, and preparation for high school mathematics courses. Students are encouraged to first attempt these review problems on their own. Checking accuracy against the solution document can help students identify their own strengths and areas of challenge. Students can utilize instructional online resources to address areas of challenge. All of these resources can be found at http://chesterfield.k12.va.us/htm/student_pages/summerheat.

Functions: (exponential, logarithmic, absolute value, trigonometric)

Domain and Range:

Describe the domain and range for:

1. $y = x^2 + 12$

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

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

4. $y = 2^x$

5. $y = |x| + 8$

6. $y = \log_{10}(x-3)$

7. $y = \sin x + 5$

8. $y = |\cos x|$

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

Asymptotes(vertical, horizontal, oblique)

Find all asymptotes (vertical, horizontal, oblique) for:

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

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

12. $y = \frac{x^2 - 3x - 7}{x - 5}$

13. $y = \frac{3x - 1}{8 - x}$

Zeros

Find all real zeros of the given function:

14. $y = 4x^2 - 12x + 4$

15. $y = 2x^3 + 11x^2 - 6x$

16. $y = x^4 + 2x^3 + x^2$

17. $y = x^4 - 8x^2 - 9$

Period/Amplitude

Give the period in radians and the amplitude (if applicable) of the following:

18. $y = -5 \sin 3x$

19. $y = 2 \tan \frac{\pi}{6}x$

20. $y = \frac{\cos 4x}{2}$

Writing the equation of a line given a graph

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

21. through (6,1) with slope $\frac{1}{2}$.
22. through (-1, -4) and (2, 5).
23. through (8, 17) and perpendicular to $y = \frac{-2}{3}x + 1$.
24. with the x-intercept of -2 and the y-intercept of 4.
25. parallel to $2x - 3y = 7$ and passes through (5, 1).

Composition of functions

Given: $f(x) = 3x - 2$; $g(x) = \sqrt{x}$;
 $h(x) = x^2 - 2x + 1$.

Find:

26. $(g \circ f)(x)$ and $(g \circ f)(9)$
27. $(f \circ h)(x)$ and $(f \circ h)(5)$
28. $(h \circ f)(x)$ and $(h \circ f)(\frac{2}{3})$
29. $(g \circ h)(x)$ and $(g \circ h)(-2)$

Finding the inverse of a function

Find the inverse function $f^{-1}(x)$, if it exists, for

30. $f(x) = \frac{2x-1}{4}$
31. $f(x) = \sqrt{3x+1}$
32. $f(x) = (x-6)^2$
33. $f(x) = \ln(x-1)$

Trigonometry (unit circle)

Without a calculator, determine the exact value of each expression.

34. $\theta = \frac{5\pi}{6}$
35. $\theta = \frac{5\pi}{4}$
36. $\theta = \frac{-3\pi}{2}$
37. $\theta = \frac{11\pi}{3}$
38. $\theta = -5\pi$
39. $\tan \frac{\pi}{6}$
40. $\tan \frac{2\pi}{3}$
41. $\tan \frac{\pi}{2}$
42. $\cos(\sin^{-1} \frac{1}{2})$
43. $\sin^{-1}(\sin \frac{7\pi}{6})$

Simplifying algebraic and trigonometric expressions

44. $\frac{\cos^2 x - 1}{\sin x}$
45. $(\sin x + \cos x)^2$
46. $\frac{\csc^2 x}{1 + \tan^2 x}$
47. $\sin x + (\cos x)(\cot x)$
48. $(\tan x + \cot x)(\sin x + \cos x)$

Factor Completely.

49. $2x^2 - 10x - 12$

50. $x^4 - 81$

51. $2x^3 + 10x^2 - x - 5$

52. $5x^4 - 40x$

Simplifying rational expressions

Simplify and reduce the rational expressions.

53. $8 - \frac{6}{x+3}$

54. $\frac{6x-8}{\sqrt{3x}-2}$

55. $\frac{1}{x+h} - \frac{1}{x}$

56. $\frac{\frac{2}{x^2}}{\frac{10}{x^5}}$

57. $\frac{\frac{1}{3+x} - \frac{1}{3}}{x}$

58. $\frac{2x}{x^2-6x+9} - \frac{1}{x+1} - \frac{8}{x^2-2x-3}$

Miscellaneous

59. Evaluate $\frac{f(x+h) - f(x)}{h}$ and simplify if

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

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

61. Simplify $x^{\frac{2}{3}}(x+x^{\frac{5}{2}}-x^2)$.

62. Expand and simplify: $\sum_{n=0}^4 \frac{n^2}{2}$.

Solving Trigonometric Equations

Solve for x, to nearest degree (0° to 360°)

63. $\sin x \tan x = \sin x$

64. $2 \sec^2 x - 5 \sec x + 2 = 0$

65. $\tan^2 x \cos x - 3 \cos x = 0$

66. $2 \cos x + \sqrt{3} = 0$

67. $8 \sin^2 x + 13 \sin x - 6 = 0$

Solving Equations

Solve for x:

68. $\log_{10}(x^2 - 15x) = 2$

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

70. $\frac{x^4 - 1}{x^3} = 0$

71. $(x-5)^2 = 9$

72. $2x^2 + 5x = 8$

73. $12x^2 = 3x$

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

75. $27^{2x} = 9^{x-3}$

76. $e^{3x} = 5$

Exponents and Logarithms

Simplify the following expressions

77. $e^{\ln 3}$

78. $e^{1+\ln x}$

79. $\ln 1$

80. $\ln e^7$

$$81. \log_3 \frac{1}{3}$$

$$82. \log_{\frac{1}{2}} 8$$

$$83. \ln \frac{1}{2}$$

$$84. e^{3 \ln x}$$

$$85. \frac{4xy^{-2}}{12x^{\frac{1}{3}}y^{-5}}$$

$$86. (5a^{\frac{2}{3}})(4a^{\frac{3}{2}})$$

$$87. \frac{3(n+1)!}{5n!}$$