

For incoming Honors Precalculus/Trig students

Cover Page - Please Read!!

The intent of this packet is to review key concepts from last year's math class so you return to school in the Fall with minimal skill loss. This packet is due the first day back in school in the fall. You will be uploading these pages onto Canvas. It will be graded. You need to get off to a good start so spend some quality time on this packet this summer.

Please write the answers to each problem in the space provided in this packet. You may include your work on this paper or on separate pieces of papers. If you are including your work on this paper, please be neat and box your final answers, so we don't have to hunt them down!

Please use the suggested website or others of your own choosing to solve these problems. Don't fake your way through these problems. Faking through these problems won't help set you in the right path for your next math class. You need to get off to a good start so spend some quality time on this packet this summer. You want these techniques to be relatively fresh in your mind in the fall, so begin working on this packet about four weeks before the start of school. Do not wait to do them at the very last minute. These take time.

Here is a good site for most algebra topics: <http://www.purplemath.com/modules/index.htm>

Topic 1 - Number Sense

Topic 2 - Algebra Foundations

Topic 3 - Linear Functions

Topic 4 - Factoring

Topic 5 - Simplifying Complex Numbers

Topic 6 - Solve Various Equations

Topic 7 - Graphs of Functions

Topic 8 - Rational Expressions and Equations

Topic 9 - Transformations of Functions

Topic 1 - Number Sense

Please complete this section without using a calculator.

1. Perform the indicated operation.

$$\frac{3}{14} + \frac{4}{21}$$

2. Perform the indicated operation.

$$\left(2 + \frac{1}{6}\right) \left(1 - \frac{4}{5}\right)$$

3. Perform the indicated operation.

$$\frac{\frac{1}{5} + \frac{1}{3}}{\frac{1}{15} + \frac{7}{35}}$$

4. Evaluate the expression $||-11| - |-10||$.

5. Evaluate the expression.

$$\left(\frac{2}{5}\right)^{-2}$$

6. Evaluate the expression.

$$\left(\frac{7}{13}\right)^0 \left(\frac{3}{4}\right)^7 \left(\frac{9}{16}\right)^{-3}$$

7. Write the exponential expression using radicals.

$$11^{-\frac{5}{2}}$$

8. Evaluate the expression.

$$\sqrt[3]{405} \sqrt[3]{225}$$

9. Simplify the expression.

$$\sqrt[3]{576} - \sqrt[3]{72}$$

10. Rationalize the denominator.

$$\frac{4}{\sqrt{3+7}}$$

Topic 2 - Algebra Foundations

11. Express the inequality $2 < x < 5$ in interval notation.

12. Simplify the expression.

$$(2x)^4 x^5$$

13. Simplify the expression.

$$\left(2x^2\right)^5 \left(\frac{1}{4}x^4\right)^4$$

14. Simplify the expression.

$$\frac{a^{-9}b^6}{a^{-4}b^4}$$

15. Write the exponential expression using radicals.

$$a^{\frac{3}{5}}$$

16. Simplify the expression.

$$x^{\frac{2}{3}} x^{\frac{1}{5}}$$

Assume that x is a positive number.

17. Simplify the expression.

$$(25b)^{\frac{1}{2}} \left(9b^{\frac{1}{5}} \right)$$

Assume that b is a positive number.

18. Perform the indicated operations and simplify.

$$(6x^2 + x + 5) + (8x^2 - 5x - 4)$$

19. Perform the indicated operations and simplify.

$$4(5t - 3) - (t^2 + 6) - 5t(t - 1)$$

20. Perform the indicated operations and simplify.

$$(t + 5)(t + 9) - 6(t + 6)$$

21. Perform the indicated operations and simplify.

$$(2 - 7y)^2$$

22. Perform the indicated operations and simplify.

$$\left(c + \frac{5}{c}\right)^2$$

23. Perform the indicated operations and simplify.

$$\left(\sqrt{a} + \frac{1}{b}\right)\left(\sqrt{a} - \frac{1}{b}\right)$$

24. Perform the indicated operations and simplify.

$$(x^2 + x - 6)(x^3 - x + 10)$$

25. Given the function $f(x) = 8x^2 + 4x - 1$, find $f(6)$.

26. Given the function $f(x) = 3|x - 4|$, find $f(11)$.

27. Determine whether the equation defines y as a function of x .

$$4x + 7y = 28$$

28. Determine whether the equation defines y as a function of x .

$$x^2 + (y - 1)^2 = 16$$

29. What is the domain of the function $f(x) = \frac{9}{5x + 10}$?

30. What is the domain of the function $f(x) = \frac{x + 8}{x^2 - 36}$?

Topic 3 - Linear Functions

31. A line passes through $(1, -5)$ and $(-3, 7)$.
- Write an equation for the line in point-slope form.
 - Rewrite the equation in slope-intercept form.

32. Find an equation for the line that passes through (2, 6) and perpendicular to $y = -\frac{5}{4}x + 1$.
33. Find an equation for the line that passes through (-4, 6) and parallel to $y = -3x + 4$.
34. Write an equation of a line that has the same slope as $2x - 5y = 12$ and the same y -intercept as $4y + 24 = 5x$.
35. Solve the system of linear equations

$$\begin{cases} 5x + 3y = -6 \\ 3x - 2y = 4 \end{cases}$$

36. Solve the system of linear equations

$$\begin{cases} x + y + 3z = -4 \\ -x - y - 2z = 5 \\ 2x - z = -3 \end{cases}$$

37. Solve the system of linear equations

$$\begin{cases} 5x - y = 5 \\ 5x - 3y = 15 \end{cases}$$

Topic 4 - Factoring

38. Factor out the common factor.

$$(z + 5)^2 - 8(z + 5)$$

39. Factor the trinomial.

$$x^2 - 10x + 24$$

40. Use a Factoring Formula to factor the expression.

$$8s^3 - 27t^3$$

41. Use a Factoring Formula to factor the expression.

$$9z^2 - 12z + 4$$

42. Factor the expression by grouping terms.

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

43. Factor completely.

$$9x^5 + 36x^9$$

44. Factor completely.

$$x^2 + 3x - 54$$

45. Factor completely.

$$3x^2 + 11x + 10$$

46. Factor completely.

$$27x^3 - 1$$

47. Use $u = a^2 + 4$ to factor completely.

$$(a^2 + 4)^2 - 21(a^2 + 4) + 104$$

48. Factor P into linear factors. $P(x) = x^4 - x^2 - 2$

Topic 5 - Complex Numbers

Simplify and write the result in the form $a + bi$.

49. $(8 + 9i) + (6 - 6i)$

50. $4(-3 + 16i)$

51. $(3 + 10i)(3 - 9i)$

52. $\frac{100 - 50i}{4 - 3i}$

53. $\frac{20}{2 - 4i}$

54. $\frac{30 + 12i}{6i}$

55. $\frac{78}{5 + i} - \frac{26}{5 - i}$

Topic 6 - Solving Equations

56. Solve the equation.

$$\frac{z}{7} = \frac{4}{35}z + 2$$

57. Solve the equation.

$$3(x + 2) + 14 = -2(x + 8) + 1$$

58. Solve the equation.

$$(t - 2)^2 = (t + 2)^2 + 72$$

59. Solve the equation.

$$\sqrt{8} + \sqrt{72} = \frac{7x+6}{\sqrt{8}}$$

60. Solve the equation.

$$\frac{1}{x} - \frac{3}{2x+16} = \frac{1}{2x^2+16x}$$

61. Find all real solutions of the equation $x^2 - 49 = 0$.

62. Find all real solutions of the equation $3x^2 - 12 = 0$.

63. Find all real solutions of the equation.

$$(x+9)^2 = 16$$

64. Find all real solutions of the equation.

$$(x-4)^3 + 1 = 0$$

65. Find all real solutions of the equation $\sqrt[3]{x} = 4$.

66. Solve the equation $P = 7l + 5w$ for l .

67. Solve the equation by factoring.

$$6w^2 = 11w - 3$$

68. Find all real solutions of the equation.

$$\theta^2 - \frac{9}{8}\theta + \frac{81}{256} = 0$$

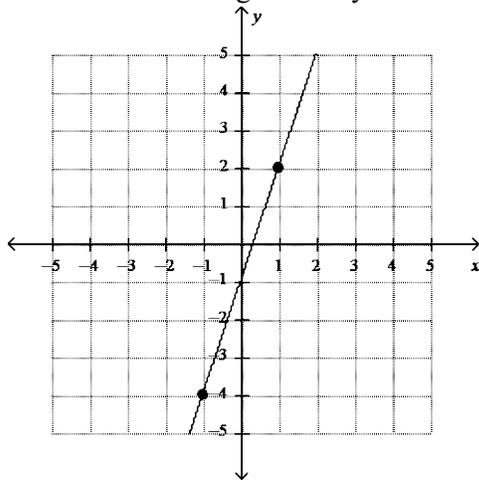
69. Find all solutions of the equation $x^2 + 9 = 0$ and express them in the form $a + bi$.
70. Find all solutions of the equation $2x^2 - 8x + 16 = 0$ and express them in the form $a + bi$.
71. Find all solutions of the equation $z + 4 + \frac{20}{z} = 0$ and express them in the form $a + bi$.

Topic 7 - Graphs of Functions

Use the degree, middle and end behaviors to solve the problem or sketch the graph.

72. Graph $y + 2 = -(x - 4)$
73. Use the slope and y -intercept to graph the equation.
 $y = \frac{3}{4}x - 3$

74. Describe this line algebraically.



75. Graph $y = -3$
76. Graph $x = -4$

77. Find the coordinates of the local extrema of the function.

$$y = x^2 - 4x$$

78. Find the domain and range of the function.

$$f(x) = x^2 - 10x + 9$$

79. How many local maxima and minima does the polynomial have?

$$y = 0.2x^5 + 2x^4 - 11x^3 - 25x^2 + 200x + 3$$

80. Find all rational zeros of the polynomial.

$$P(x) = x^4 - 26x^2 + 25$$

81. Find all the real zeros of the polynomial.

$$P(x) = 8x^3 - 12x^2 + 2$$

82. Find all of the real zeros for the following polynomial and sketch the graph of P .

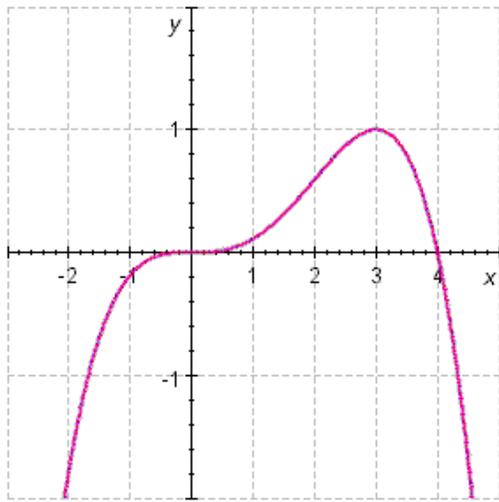
$$P(x) = x^3 - 6x^2 - 9x + 54$$

83. $P(x) = x^4 + 16x^2$ Find all zeros of P , real and complex.

84. Find all zeros of P , real and complex. $P(x) = x^3 + 8$

85. Factor the polynomial $P(x) = x^3 + x^2 + 25x + 25$ completely and find all its zeros.

86. The graph of a polynomial function $P(x) = -\frac{1}{27}x^4 + \frac{4}{27}x^3$ is given.



- (a) From the graph, find the x -intercept(s).

$x =$ _____

- (b) From the graph, find the y -intercept(s).

$y =$ _____

- (c) From the graph, find the coordinates of all local maxima.

- (d) From the graph, find the coordinates of all local minima.

87. Find the minimum or maximum value of the function.

$$f(x) = x^2 + x + 2$$

88. Sketch the graph of the function.

$$P(x) = (x - 1)(x + 1)(x - 2)$$

89. Sketch the graph of the function.

$$P(x) = \frac{1}{3}(x + 1)^3(x - 3)$$

90. Sketch the graph of the function.

$$P(x) = (x - 2)^2(x - 3)$$

91. Find the inverse function of $f(x) = 9x + 45$. Sketch both functions on the same coordinate plane.

Topic 8 - Rational Expressions and Equations

92. Simplify the expression.

$$\frac{x - 7}{x^2 - 49}$$

93. Simplify the expression.

$$\frac{3y^2 - 4y - 7}{9y^2 - 49} + \frac{y^2 - 2y - 3}{3y^2 - 2y - 21}$$

94. Simplify the expression.

$$\frac{1}{x + 3} + \frac{1}{x + 1}$$

95. Simplify the expression.

$$\frac{x}{x^2 + 4x + 3} - \frac{5}{x^2 + 6x + 5}$$

96. Simplify the expression.

$$\frac{1}{x + 3} - \frac{2}{(x + 3)^2} + \frac{8}{x^2 - 9}$$

97. Simplify the expression.

$$\frac{1 + \frac{1}{x - 8}}{1 - \frac{1}{x - 8}}$$

98. Solve the equation.

$$\frac{1}{x} = \frac{9}{4x} + 5$$

99. Solve the equation.

$$\frac{8}{x-9} + \frac{10}{x+9} = \frac{108}{x^2-81}$$

100. Find all real solutions of the equation.

$$\frac{1}{x-4} - \frac{25}{x^2} = 0$$

101. Find all real solutions of the equation.

$$\left(\frac{x}{x+6}\right)^2 = \frac{6x}{x+6} - 9$$

Topic 9 - Transformations of Functions

102. Consider a family of functions $f(x) = 2(x - c)^3$. Graph all the given members of the family in the viewing rectangle indicated.

(a) $c = 0, 2, 4, 6$; $[-10, 10]$ by $[-20, 20]$

(b) $c = 0, -2, -4, -6$; $[-10, 10]$ by $[-20, 20]$

How does the value of c affect the graph?

103. Consider a family of functions $f(x) = 4x^2 + c$. Graph all the given members of the family in the viewing rectangle indicated.

(a) $c = 0, 8, 16, 24$; $[-5, 5]$ by $[-40, 40]$

(b) $c = 0, -8, -16, -24$; $[-5, 5]$ by $[-40, 40]$

How does the value of c affect the graph?

104. Describe how the graph of the function, $y = f(-x)$ can be obtained from the graph of f .
105. Describe how the graph of the function $y = 7f(x) - 3$ can be obtained from the graph of f .
106. Describe how the graph of the function $y = 4f(x + 5) - 3$ can be obtained from the graph of f .