To: Rising MHS Honors Precalculus Students

From: Maryville High School Honors Precalculus Teachers

Subject: Summer Mathematics Packet (for all MHS honors math students)

Greetings, and congratulations for registering for a rigorous, challenging, and – hopefully – fun course in higher mathematics. Entering a precalculus course on the first day thoroughly prepared is essential to success. You have received an excellent foundation in your Algebra 2 and Geometry courses. Some summer review of basic, pre-requisite skills from those courses, will allow us to "hit the ground running" without leaving anyone behind.

Attached, please find a Summer Worksheet: Review exponents, radicals, polynomials, rational expressions, linear equations, & quadratic equations. Your precalculus teacher will assume that you have mastered all the concepts and techniques contained in this packet. Your first test to be given the second week of the term will include these concepts. No class time will be devoted to this review; you are expected to complete it independently – or, perhaps better still, in small learning communities – this summer, or, if you procrastinate (not a good idea!), during the first week of school. ==Your teachers will be available before and/or after school the first week to answer questions.==

If this seems like a lot to ask of you, know this: precalculus is a demanding subject. Honors precalculus is senior-level mathematics. It requires dedication and work, generally one hour each evening. The pace is fast and relentless. You must be willing to keep up and to get help outside of class as needed. If you do your part, you should have a successful experience, gain an enormous amount of mathematical proficiency and understanding, and earn some "bragging rights." Your teachers are here to help you; this summer packet is evidence of that. We care enough about you to make certain you are ready to succeed.

Note, pages to which to refer are listed throughout the worksheet. Those pages go along with the textbook you will get once the school year starts. In the meantime, you might refer to online sources for extra help. You Tube, for example, offers an abundance of short videos on various topics posted by high school teachers.

Honors Precalculus   Name_____
Summer Worksheet: Review exponents, radicals, polynomials, rational
                        expressions, linear equations, & quadratic equations

> Show your work on your own notebook paper
> using clear, organized, and vertical steps.

*Rewrite in simplest exponent form and then evaluate without a calculator.
(Refer to the properties of exponents on page AI4.)

1. $3^2 \bullet 3^3$

2. $\dfrac{5^5}{5^2}$

3. $\left(2^3\right)^2$

*Evaluate without a calculator.
(Consider the properties of exponents and the order of operations.)

4. $\left(2^3 \bullet 3^2\right)^2$

5. $\left(\dfrac{-3}{5}\right)^3 \bullet \left(\dfrac{5}{3}\right)^2$

6. $\dfrac{3 \bullet 4^{-4}}{3^{-4} \bullet 4^{-1}}$

7. $2^{-1} + 3^{-1}$

8. $\left(2^{-1}\right)^{-2}$

9. $\left(3^{-2}\right)^2$

*Simplify each expression.
(Refer to examples 2 and 3 on page A15.)

10. $5x^4(x^2)$

11. $(4x^3)^2$

12. $6x^2(2x^4)^2$

13. $\dfrac{25x^8}{10x^4}$

14. $\dfrac{9(x+y)^2}{12(x+y)^3}$

*Rewrite in simplest radical form and then evaluate without a calculator.
(Refer to examples 16a and 18a on page A23.)

15. $9^{\frac{1}{2}}$

16. $64^{\frac{1}{3}}$

17. $-\left(27^{\frac{2}{3}}\right)$

18. $81^{\frac{-3}{4}}$

19. $\left(\dfrac{32}{243}\right)^{\frac{1}{5}}$

20. $\left(\dfrac{9}{4}\right)^{\frac{-1}{2}}$

21. $\left(\dfrac{-64}{27}\right)^{\frac{-1}{3}}$

*Simplify.
(Refer to example 8 on page A18 and examples 10 and 11 on page A20.)

22. $\sqrt{8}$

23. $\sqrt[3]{250}$

24. $\sqrt[4]{162}$

25. $\sqrt[5]{96}$

*Rationalize the denominator.
(Refer to examples 13a and 14 on pages A21 and A22.)

26. $\dfrac{1}{\sqrt{3}}$

27. $\dfrac{5}{\sqrt{10}}$

28. $\dfrac{2}{5-\sqrt{3}}$

*Simplify and then combine.
(Refer to example 12 on page A21.)
29. $2\sqrt{50} + 12\sqrt{8}$ 　　　　30. $\sqrt[3]{16} - 3\sqrt[3]{54}$

*Multiply the polynomials.
(Refer to examples 3 and 4 on pages A28 and A29.)
31. $(3x^3 - 5)(2x^2 + 1)$ 　　32. $(4x + 5)^2$ 　　　　33. $(2x^5 + 3)(2x^5 - 3)$
34. $(x - 2)^3$ 　　　　　　35. $(x + 2)(x - 2)(x^2 + 4)$ 　36. $(3x + 1)(x^2 - 7x - 4)$

*Factor out the GCF.
(Refer to example 5 on page A30.)
37. $4x^3 - 6x^2 + 12x$ 　　　38. $3x(x + 2) + 4(x + 2)$ 　39. $(3x - 1)^2 + (3x - 1)$

*Factor the difference of 2 squares.
(Refer to examples 6 and 7 on page A31.)
40. $16x^2 - 9$ 　　　　　41. $25 - (x + 5)^2$

*Factor the perfect square trinomial.
(Refer to example 8 on page A32.)
42. $36x^2 - 108x + 81$

*Factor the sum or difference of cubes.
(Refer to examples 9 and 10 on page A32.)
43. $x^3 + 125$ 　　　　　44. $8x^3 - 1$

*Factor the trinomial.
(Refer to examples 11 and 12 on page A33 and example 14 on page A34.)
45. $20 - x - x^2$ 　　　　46. $12x^2 + 7x + 1$ 　　　47. $15x^6 - 11x^3 + 2$

*Factor by grouping.
(Refer to example 13 on page A34.)
48. $8x^5 - 6x^2 + 12x^3 - 9$

*Simplify.
(Refer to examples 2 through 8 on pages A40 through A43.)

49. $\dfrac{12 - 4x}{x - 3}$ 　　　50. $\dfrac{x^3 + 5x^2 + 6x}{x^2 - 4}$ 　　　51. $\dfrac{x^2 - 7x + 6}{x^2 + 11x + 10}$

52. $\dfrac{x^2 - x - 6}{x^2 + 6x + 9} \cdot \dfrac{x + 3}{x^2 - 4}$ 　53. $\dfrac{x^2 - 14x + 49}{x^2 - 49} \div \dfrac{3x - 21}{x + 7}$ 　54. $6 - \dfrac{5}{x + 3}$

55. $\dfrac{3}{x - 2} + \dfrac{5}{2 - x}$ 　　56. $\dfrac{1}{x^2 - x - 2} - \dfrac{x}{x^2 - 5x + 6}$ 　57. $\dfrac{2}{x + 1} + \dfrac{2}{x - 1} + \dfrac{1}{x^2 - 1}$

58. $\dfrac{\dfrac{x-4}{x}}{\dfrac{x}{4}-\dfrac{4}{x}}$

59. $\dfrac{\dfrac{1}{x}-3}{x-3}$

60. $\dfrac{\dfrac{x^2-1}{x}}{\dfrac{(x-1)^2}{x}}$

*Solve the linear equations (and the rational equations which turn out to be linear upon clearing fractions).
(Refer to pages A49-A51.)

61. $3(x+3)=5(1-x)-1$ 62. $x-3(2x+3)=8-5x$ 63. $\dfrac{x}{5}-\dfrac{x}{2}=3+\dfrac{3x}{10}$

64. $\dfrac{100-4x}{3}=\dfrac{5x+6}{4}+6$ 65. $\dfrac{17+x}{x}+\dfrac{32+x}{x}=100$ 66. $3=2+\dfrac{2}{x+2}$

67. $(2x+1)^2=4(x^2-x+1)$

*Solve the quadratic equations by factoring.
(Refer to page A53, example 4.)

68. $6x^2+3x=0$ 69. $9x^2-4=0$
70. $4x^2+12x+9=0$ 71. $2x^2=19x+33$

*Solve the quadratic equations by taking square roots.
(Refer to page A53, example 5.)

72. $(x-12)^2=16$ 73. $(2x-1)^2=18$

*Solve the quadratic equations by completing the square.
(Refer to page A54, examples 6 & 7.)

74. $x^2+12x+25=0$ 75. $3x^2-12x-2=0$

*Solve the quadratic equations using the Quadratic Formula.
(Refer to page A55, examples 8 & 9.)

76. $16x^2+22=40x$ 77. $(x-5)^2=2x$ 78. $-0.067x^2-0.852x+1.277=0$