FDA
Summer Math Practice

On the following pages are review problems from Algebra II that represent important skills needed for Functions and Data Analysis. You are to work the problems in this packet on these pages. Leave a clear trace of how you derive your answers, and keep the problems neat and easy to follow.

Honor Code Reminder: You can work with (but not copy from) your classmates and use your books, notes, and other references (Khan Academy, for example) but no calculators. The work you turn in must be your work and not the work of a tutor.

Make sure that you understand the material. None of these concepts should be new. If, however, you are a little rusty and find that you need some help, there are Tuesday morning help sessions available at MUS from 9 AM – 12 PM during June, July, and August.

This packet needs to be ready for submission on the second day we have a full class. The packet will be graded, and you will be quizzed on the material. Feel free to get help from me during Convocation week if you need it.

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Pledge in full: ________________________________________________

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**I. Factoring:** Factor each of the following polynomials completely. If the polynomial cannot be factored, write "prime."

1. \(x^2 - 36\)  
2. \(1 - 4x^2\)  
3. \(x^2 + 7x + 10\)  
4. \(x^2 - 2x + 8\)  
5. \(15 + 2x - x^2\)  
6. \(3x^2 - 12x - 36\)  
7. \(4x^2 + 12x + 9\)  
8. \(3x^2 + 4x + 1\)  
9. \(x^4 - 81\)
10. \(5 + 16x - 16x^2\)

11. \(4y^2 - 16y + 15\)

12. \(1 - 8x^2 - 9x^4\)

13. \(x^3 + 27\)

14. \(8x^3 - y^3\)

15. \(x^2(x - 3) + 4(x - 3)\)

16. \(x^3 + 2x^2 - x - 2\)

17. \(x^4 - x^3 + x - 1\)
II. Rational Expressions: Perform the indicated operations and simplify the result. Leave your answer in factored form.

1. \( \frac{3x + 6}{5x^2} \cdot \frac{x}{x^2 - 4} \)

2. \( \frac{2x^2 - 3x - 2}{x^2 - 2x - 35} \cdot \frac{x^2 - 49}{2x^2 + 5x + 2} \)

3. \( \frac{x^2 - x - 6}{x^2 - 9} \div \frac{x + 2}{x + 3} \)

4. \( \frac{x + 1}{x - 3} + \frac{2x - 3}{x - 3} \)

5. \( \frac{4}{x - 2} + \frac{x}{2 - x} \)
III. Radicals: Perform the indicated operations by hand and simplify your result. Assume all variables are positive when they appear in a problem.

1. \((3\sqrt{6})(2\sqrt{2})\)  

2. \((\sqrt{3} + 3)(\sqrt{3} - 1)\)  

3. \((\sqrt{x} - 1)^2\)  

4. \((\sqrt{5x}\sqrt{20x^3})\)  

6. \(\frac{4}{x-1} - \frac{2}{x-2}\)  

7. \(\frac{x}{x-1} - \frac{x+1}{x+2}\)  

8. \(\frac{1 + \frac{1}{x}}{1 - \frac{1}{x}}\)
Simplify each expression by hand

5. \(8^{2/3}\) 

6. \((-27)^{1/3}\) 

7. \(9^{-3/2}\) 

8. \(\left(\frac{9}{25}\right)^{3/2}\) 

9. \(\left(\frac{8}{27}\right)^{-2/3}\) 

Simplify each expression. Express your answer so that only positive exponents occur. Assume that the variables are positive.

10. \((8xy)^{1/3} \left(x^{1/3} y^{1/3}\right)^2\) 

11. \(\left(16x^2 y^{-2/3}\right)^{3/4}\)
IV. Sketch a graph of each equation. Label significant points, such as vertices, co-vertices, centers, foci, and intercepts, along with any other pertinent features such as asymptotes and directrices.

1. \(f(x) = -\sqrt{x-1} + 3\) 

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

3. \(f(x) = x(x-3)^2(x+5)\) 

4. \(f(x) = x^2 + 2x - 3\)
5. \[25x^2 + 4(y - 1)^2 = 100\]

6. \[f(x) = \frac{x}{(x-3)(x+2)}\]

7. \[4x^2 + 4(y - 1)^2 = 64\]

8. \[f(x) = \frac{2x - 8}{(x+3)}\]
V. Logarithms

Evaluate without a calculator:

1. \( \log_3 27 \)

2. \( \log_4 \left( \frac{1}{16} \right) \)

3. \( \log_3 \left( \frac{27}{81} \right) \)

4. \( \log_{10} 10^e \)

5. \( \log_3 \left( \sqrt[4]{\frac{1}{9}} \right) \)

6. \( \log_5 25^{1.4} \)

Write in logarithmic form:

7. \( 4^{3/2} = 8 \)

8. \( 5^x = 6 \)
Write as a single logarithmic expression:

9. \(2\log(x-2) + 3\log(x+4) - 5\log(x-1)\) 

10. \(3\ln x - 4\ln y + \frac{1}{2}\ln z\) 

11. \(2\log_4(x - 3) - 3\log_4(x + 2)\) 

Write the expanded version of each of the following logarithmic expressions.

12. \(\log^3\sqrt{\frac{x^2}{x - 2}}\) 

13. \(\log\left(\frac{10}{x^3(x - 3)^2}\right)\)
VI. Solving Equations:

Solve the following equations: (Leave your answers as exact values.)

1. \( x^2 - 4x - 21 = 0 \)  
   
2. \( x^2 - 6x = 13 \)  
   
3. \( 2x^3 - x^2 - 2x + 1 = 0 \)  
   
4. \( 2x^4 + 3x^2 - 20 = 0 \)  
   
5. \( x^3 + 2x^2 - 6x = 12 \)  
   
6. \( (3x - 2)^2 = 121 \)  
   

7. \[ \frac{x + 3}{x - 3} + \frac{x - 3}{x + 3} = \frac{18 - 6x}{x^2 - 9} \]

8. \[ \frac{r}{r - 1} - \frac{r}{r + 1} = \frac{2}{r^2 - 1} \]

9. \[ \frac{t^2 + 1}{t + 2} = \frac{t}{3} + \frac{5}{t + 2} \]

10. \[ \frac{x + 2}{x^2 - x - 6} = 3 - \frac{4}{x - 3} \]
11. \(2\sqrt{x} = x - 8\)

12. \(\sqrt{2x + 5} = x + 1\)

13. \(\sqrt{y - 3} = 1 - \sqrt{2y - 4}\)

14. \(8^x = 2^6\)

15. \(2^{3x} = 2^{x+1}\)

16. \(3\sqrt{3} = 3^x\)

17. \(27^{1-x} = \left(\frac{1}{9}\right)^{2-x}\)
18. \( (8 - x)^{-3} = 64 \)

19. \( (2x)^{-2} = 64 \)

20. \( \log x + \log 3 = \log 5 \)

21. \( \log (x + 1) + \log (2) = -1 \)

22. \( \log_3(2x) = 4 \)

23. \( \log_3(x^2 - 25) - \log_3(x + 5) = 1 \)