Honors Math Analysis
Summer Review Homework Name:_____

Welcome to Honors Math Analysis!

I am excited to delve more deeply into many math topics with you next year!

In order to be best-prepared for our endeavors next year, I have included a number of worksheets for your summer homework. Reviewing these topics will help you to be ready to take on more advanced work next year.

I especially encourage you to diligently work through the problem sets if you are new to the honors level.

You will be expected to solve problems without a calculator throughout the year so now is the time to practice your skills. (Don't worry … we also use our calculators throughout the year!! :)

I will post the answer keys to all worksheets in August so you can refer to them as needed. I know that checking your answers and figuring out your own mistakes is a useful strategy.

Complete the work at your own pace throughout the summer – I will collect it the first day of school. Your first points of the year!! You can expect a quick quiz on the first day as well – nothing too difficult … just a way to check your understanding.

Have a great summer and I look forward to next year!

Mrs. Loeffler
sloeffler@vischool.org

Honors Math Analysis

Summer HW Name:_____

You should be able to do all of these <u>WITHOUT A CALCULATOR!</u> PRACTICE!
CIRCLE your answers clearly!
*Adapted from SMANewOrleans & Glenbard East High School

Function Notation

A. Given: $f(x) = 2x$, $g(x) = 3x - 2$, and $h(x) = x^2 - 4$. Find the following, showing your work in the space provided.

1) $f[g(2)] =$

2) $g\big(f(2)\big) =$

3) $f\big(h(3)\big) =$

4) $f[g(x)] =$

5) $h(x + 2) =$

6) $h\big(g(x - 1)\big) =$

B. Using the graph of a(x), the table of b(x), and the equation of c(x) below, evaluate these compositions.

7) $a\big(a(7)\big) =$

8) $b\big(b(3)\big) =$

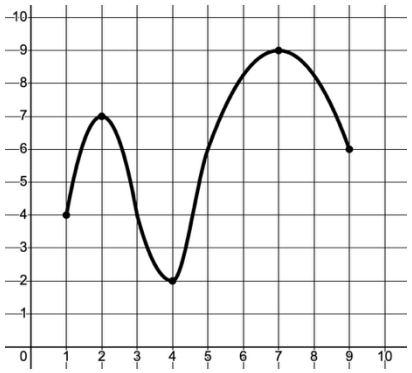
9) $c\big(c(x)\big) =$

10) $a\big(b(5)\big) =$

11) $b\big(c(4)\big) =$

12) $c\big(a(2)\big) =$

Graph of $a(x)$:	**Table of $b(x)$:**	$c(x) = 2x - 3$



x	$b(x)$
1	3
2	5
3	2
4	7
5	**1**
6	9
7	6
8	4
9	0

Rules of Exponents		
$a^m \cdot a^n = a^{m+n}$	$(a^m)^n = a^{m\,n}$	$(a)^{\frac{p}{r}} = \sqrt[r]{a^p}$
$a^{-n} = \frac{1}{a^n}$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$\frac{a^m}{a^n} = a^{m-n}$

C. Simplify each, showing all work. Answers should have only positive exponents. Do these without a calculator.

13) $5x^0 \cdot 4x^2y$

14) $\frac{2xy^{-1}}{x^{-1}}$

15) $\frac{5x}{x^{-1}}$

16) $(3y)^{-3}(3x^2)^2$

17) $\frac{(m^3n^{-1})^2}{(mn)^{-2}}$

18) $(-x^2y^3)^5$

19) $5m(3n^2m)$

20) $\frac{2^4 8^2 16^{-5}}{32^{-2}}$

21) $(4^{-1} + 5^{-1})^2$

22) $3x^{-\frac{1}{6}}\left(4x^{\frac{1}{6}} - 5x^{-\frac{5}{6}}\right)$

23) $\frac{(\sqrt{3a})^5}{(\sqrt{3a})^9}$

24) $\frac{(\sqrt[3]{2m})^2}{(\sqrt[6]{8m^5})}$

Radicals & rational exponents

Simplify radicals whenever possible:

ex1) $\sqrt{x^5 y^7 z^6}$

$\sqrt{x^2 x^2 x \cdot y^2 y^2 y^2 y \cdot z^2 z^2 z^2}$

$x \cdot x \cdot y \cdot y \cdot y \cdot z \cdot z \cdot z\sqrt{x \bullet y}$

$x^2 y^3 z^3 \sqrt{xy}$

ex2) $\sqrt[3]{-32}$

$\sqrt[3]{-2 \cdot -2 \cdot -2 \cdot 2 \cdot 2}$

$-2\sqrt[3]{4}$

ex3) $3x\sqrt{2x} \bullet 4x^2\sqrt{5x}$

$3x \cdot 4x^2\sqrt{2x \cdot 5x}$

$12x^3\sqrt{10x^2}$

$12x^4\sqrt{10}$

ex4) $5\sqrt{27} + 4\sqrt{2} + 7\sqrt{3}$

$15\sqrt{3} + 4\sqrt{2} + 7\sqrt{3}$

$22\sqrt{3} + 4\sqrt{2}$

Rationalize fractions with radicals in the denominator:

ex5) $\sqrt{\frac{24}{15}}$

$\sqrt{\frac{8}{5}}$

$\frac{2\sqrt{2}}{\sqrt{5}}$

$\frac{2\sqrt{2}}{\sqrt{5}} \bullet \frac{\sqrt{5}}{\sqrt{5}}$

$\frac{2\sqrt{10}}{5}$

ex6) $\frac{2}{\sqrt[4]{32}}$

$\frac{2}{\sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}}$

$\frac{2}{2 \cdot \sqrt[4]{2}}$

$\frac{1}{\sqrt[4]{2}}$, now rationalize

$\frac{1}{\sqrt[4]{2}} \bullet \frac{\sqrt[4]{2 \cdot 2 \cdot 2}}{\sqrt[4]{2 \cdot 2 \cdot 2}}$

$\frac{\sqrt[4]{8}}{\sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2}}$

$\frac{\sqrt[4]{8}}{2}$

ex7) $\frac{1}{2-\sqrt{3}}$

$\frac{1}{2-\sqrt{3}} \bullet \frac{2+\sqrt{3}}{2+\sqrt{3}}$

$\frac{2+\sqrt{3}}{2^2 - \left(\sqrt{3}\right)^2}$

$\frac{2+\sqrt{3}}{4-3}$

$2+\sqrt{3}$

D. Simplify each without a calculator:

25) $\sqrt{\frac{11}{9}}$

26) $\sqrt{64x^2y^{10}}$

27) $\sqrt{(2x)^8}$

28) $\sqrt[3]{24}$

29) $\sqrt{60} \cdot \sqrt{105}$

30) $(\sqrt{5} + \sqrt{6})(\sqrt{5} - \sqrt{2})$

31) Write in radical form and simplify: $64^{\frac{1}{2}}$

32) Simplify, then add like radicals:
$\sqrt{18} - \sqrt{75} + \sqrt{8} - 4\sqrt{2}$

33) Write in rational exponent form:
$10\sqrt[5]{x^3}$

34) Write in rational exponent form:
$\sqrt[5]{10x^3}$

E. Rationalize each:

35) $\frac{5}{2\sqrt{3}}$ 36) $\frac{2}{\sqrt[3]{5}}$ 37) $\frac{2}{3+\sqrt{7}}$

Factoring Strategies

1. **Greatest Common Factor (GCF)**
2. **Difference of Squares**
3. **Trinomials**
4. **Factoring patterns: Sum & Difference of Cubes**

   $\boldsymbol{a^3 + b^3 = (a+b)\left(a^2 - ab + b^2\right)}$

   $\boldsymbol{a^3 - b^3 = (a-b)\left(a^2 + ab + b^2\right)}$
5. **Grouping**

Factor each <u>COMPLETELY</u>

F. Trinomials:

38) $2x^2 + 5x + 3$ 39) $3x^2 + 7x + 2$ 40) $2x^2 - 9x - 5$

41) $6x^2 - 11x + 3$ 42) $6x^2 - 13x - 5$ 43) $6x^2 - 17x + 5$

44) $7x^2 - 10x + 3$ 45) $7x^2 + 9x + 2$ 46) $5x^2 + 9x - 2$

47) $5x^4 - 25x^3 + 30x^2$ 48) $3y^2 - 17xy - 6x^2$ 49) $2x^2 + xy - 6y^2$

G. Difference of perfect squares: (Is it COMPLETELY factored?)

50) $49x^4 - 225y^8$

51) $81a^4 - 16b^8$

H. Sums and differences of perfect cubes: (LOOK at the factoring patterns!)

52) $125x^3 + 1$

53) $27x^3 - 8$

I. Polynomials in quadratic form: (Be sure to FACTOR COMPLETELY!)

54) $9x^4 - 37x^2 + 4$

55) $2x^9 + 10x^6 + 12x^3$

56) $x^8 - 5x^4 - 36$

57) $5x^4 - 79x^2 - 16$

J. Factor by grouping: (FACTOR COMPLETELY!)

58) $3my + 7x + 7m + 3xy$

59) $4ax - 14bx + 35by - 10ay$

60) $x^3 + 2x^2 - x - 2$

61) $x^3 + y^3 - x^2y - xy^2$

Rational Expressions

K. Simplify the following expressions to a single fraction. *Leave your answer in factored form.*

62) $\frac{x}{x-3}+\frac{2}{3x+4}$

63) $\frac{x^2-5x+6}{x-2}$

64) $\frac{1-x}{x-1}$

65) $\frac{\frac{x^2}{x-1}}{\frac{2x}{x-1}}$

66) $\frac{\frac{3}{x+1}-4}{\frac{2x}{x+1}}$

Adapted from https://www.cotterschools.org/

L. Evaluate using the order of operations, PERMDAS:

67) $\frac{3xy^2-1}{3x^3y+1}$ when $x=-3, y=-2$

68) $-x^2-4x$ when $=-1$

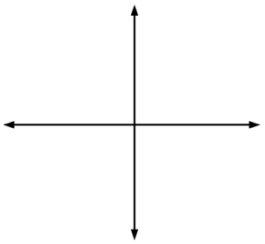
M. Name the quadrant:

69) The point $A(5,-4)$ lies in which quadrant?

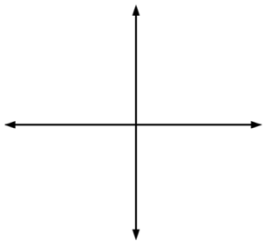
70) In which quadrant is the terminal side of $\theta=-\frac{4\pi}{3}$?

N. Sketch the graphs of the following linear equations:

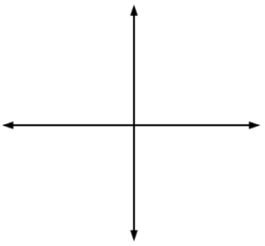
71) $x = -3$



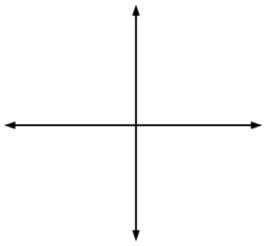
72) $y = 5$



73) $y = -3x + 5$



74) $2x - 3y = 6$



O. Answer the following about linear functions:

75) Find the slope of $(-15, 11)$ and $(8, -4)$

76) Find the intercepts of $-4x - 3y = 16$

x-intercept _____

y-intercept _____

77) Rewrite in slope-intercept form:
$-4x - 3y = 1$

slope: _____ y-intercept _____

78) Write an equation of the line containing $(1, 1)$ and $(2, -2)$.

79) Write an equation of the line passing through $(7, 2)$ and having a slope of 0.

80) Write an equation of the line having an undefined slope (no slope) and passing through the point $(-2, 5)$.

P. Rational expressions – Simplify COMPLETELY (may leave as factors)

81) $\dfrac{x^2+6x+8.}{x^2+3x} \div \dfrac{x^2+x-2}{4x^2+12x}$

82) $\dfrac{\frac{2}{3x}}{\frac{1}{2}+\frac{5}{3x}}$

83) $\dfrac{\frac{x^2+2x+1}{x^2-4}}{\frac{x+1}{x^2-x-6}}$

Q. Find the following EXACT values, given the triangles pictured below.

84) Find $\sin(D) =$ _____ , $\cos(D) =$ _____ , $\tan(D) =$ _____

85) Find $\sin(E) =$ _____ , $\cos(E) =$ _____ , $\tan(E) =$ _____

86) $v =$ _____ , $w =$ _____ , $x =$ _____ , $y =$ _____ , $z =$ _____

