

**Summer Assignment for students ENTERING:
Pre-Calculus Honors**

Please have the following worksheets completed and ready to be handed in on the first day of class, August 16, 2023. Make sure you show your work where appropriate. Answers are provided for you to check at the end of this packet; however, you will not be given credit if you don't show work on problems that require it. Please neatly organize your work, show all of your work, and place all of your work and answers ON these worksheets. It is expected that you have a good understanding of this material coming into Pre-Calculus Honors, as teachers will not be doing an extensive review of previously learned material.

Have a great summer and we look forward to seeing you in the fall!

The CCHS Math Department

0.1 - Factoring and Operations with Rational Expressions

Factor each expression in #1-10.

$$1. \ x^4 - 9x^2$$

$$2. \ x^2 + 4x - 32$$

$$3. \ x^4 + 4x^2 - 32$$

$$4. \ x^6 + 4x^3 - 32$$

$$5. \ 6x^2 - x - 2$$

$$6. \ 10x^2 - 31x + 15$$

$$7. \ x^3 - 2x^2 - 7x + 14$$

$$8. \ x(x-4)^3(x-2) - 3(x-4)^2(x-2)^2$$

$$9. \ (x+1)^3(x^3 + 8x) - 8(x+1)^4$$

$$10. \ 6x(x-2)^2(2x^2 + 1)^2 + 2(2x^2 + 1)(2-x)^3$$

Simplify each rational expression in #11-17.

$$11. \ \frac{9-x^2}{x^3 - 27}$$

$$12. \ \frac{3x^2 - 17x + 20}{6x^2 - 7x - 5}$$

$$13. \ \frac{x^2 + x + 1}{x^6 - 1}$$

$$14. \ \frac{(x+6)^4(x-3)^4 - (x-3)^3(x+6)^5}{3(3-x)^2}$$

$$15. \ \frac{x^2 - 6x + 9}{x^2 - 1} \cdot \frac{2x^2 - 2x}{x-3}$$

$$16. \ \frac{4x^2 - 9}{2x^2 - 13x + 15} \div \frac{4x^2 - 1}{2x^2 - 11x + 5}$$

$$17. \ \frac{7+6x-x^2}{3x-2} \cdot \frac{2x-3}{x^2-8x+7} \div \frac{1-x^2}{x^2-2x+1}$$

Answers:

1. $x^2(x-3)(x+3)$
2. $(x+8)(x-4)$
3. $(x^2+8)(x-2)(x+2)$
4. $(x^3-4)(x+2)(x^2-2x+4)$
5. $(3x-2)(2x+1)$
6. $(5x-3)(2x-5)$
7. $(x-2)(x^2-7)$
8. $(x-4)^2(x-2)(x-6)(x-1)$
9. $(x+1)^3(x-2)(x^2+2x+4)$
10. $4(x-2)^2(2x^2+1)(3x^3+x+1)$
11. $\frac{-(3+x)}{x^2+3x+9}$
12. $\frac{x-4}{2x+1}$

13. $\frac{1}{(x-1)(x+1)(x^2-x+1)}$
14. $-3(x+6)^4(x-3)$
15. $\frac{2x(x-3)}{x+1}$
16. $\frac{2x+3}{2x+1}$
17. $\frac{2x-3}{3x-2}$

0.2 - Simplifying Expressions and Solving Equations

Simplify each expression.

1. $\frac{5}{x-1} + \frac{8}{(x-1)^2} - \frac{3}{(x-1)^3}$

2. $\frac{3x-2}{x-1} + \frac{2}{1-x} - \frac{x}{1-x}$

3. $\frac{x}{3+x} - \frac{x}{3-x} - \frac{x^2}{x^2-9}$

4. $2x+1 - \frac{6x^3+x^2-1}{2x-1}$

5. $\frac{x^2+1}{x-1} - x+1 - \frac{x^2-1}{1-x} + \frac{x^3+x+4}{x^2-1}$

6. $\frac{6}{1-3x} - \frac{1}{2x-1} + \frac{3}{x} + \frac{x}{5x-6x^2-1}$

7. $\frac{x+3}{x^2+5x+6} + \frac{x+2}{x^2+8x+12} - \frac{3}{x+6}$

8. $\frac{1+\frac{2}{x^2}+\frac{1}{x^4}}{1+\frac{2}{x}+\frac{1}{x^2}}$

9. $\frac{\frac{x^2-1}{x}}{x+\frac{1}{x}+1}$

10. $\frac{\frac{2x+h}{x+h}+1}{\frac{2x+h}{x+h}-1}$

11. $\frac{4-\frac{1}{1-x}}{16+\frac{7}{x^2-1}}$

Solve for real values of x - give answers in exact form.

12. $x - \frac{2x-1}{3} = \frac{3x-5}{5}$

13. $7x - 4(x-6) = 3(x-8)$

14. $4x^2 - 9x + 2 = 0$

15. $2x^2 + 3 = 6x$

Answers:

1. $\frac{5x^2-2x-6}{(x-1)^3}$
 2. 4
 3. $\frac{x^2}{(x+3)(x-3)}$
 4. $-3x^2$
 5. $\frac{(2x+3)(x^2+1)}{(x+1)(x-1)}$
 6. $\frac{2x^2-8x+3}{x(2x-1)(3x-1)}$

7. $\frac{-x+2}{(x+6)(x+2)}$
 8. $\frac{(x^2+1)^2}{x^2(x+1)^2}$
 9. $x-1$
 10. $\frac{3x+2h}{x}$
 11. $\frac{x+1}{4x+3}$

12. 5
 13. All real numbers
 14. $\frac{1}{4}, 2$
 15. $\frac{3 \pm \sqrt{3}}{2}$

0.3 - Factoring, Simplifying, Operations with Rational Expressions, Linear Equations

Factor each expression completely.

1. $2x^7 - 128x$

2. $10x^6 + 17x^3 + 6$

3. $4x^4 - 37x^2 + 9$

4. $x(x-3)^4 + 4(3-x)^3$

5. $5x^3(x-5)^4(2x+1) - 10x^2(x-5)^3(2x+1)^2$

Simplify each expression.

6. $\frac{x^3 - 6x^2 + 9x}{(3-x)^4}$

7. $\frac{x^3 + 8}{(2-x)^3} \cdot \frac{x^2 - 4x + 4}{x^4 - 16}$

8. $\frac{1 - \frac{6}{x} + \frac{5}{x^2}}{\frac{1}{x^2} - \frac{5}{x^3}}$

9. $\frac{1 + \frac{2}{x-1}}{\frac{x^2 + x}{x^2 + x - 2}}$

10. $\frac{\frac{1}{x-2} - \frac{1}{x-3}}{1 + \frac{1}{x^2 - 5x + 6}}$

11. $\frac{x}{2-3x} + \frac{2x}{3x+2} - \frac{2-7x}{9x^2-4}$

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

Give the equation of each line described in #13-21.

 13. through $(2, 8)$ and $(7, 1)$

 14. through $(0, 7)$ and $(4, -6)$

 15. through $(8, 2)$ and the origin

 16. through $(5, 6)$ and horizontal

 17. through $(5, 6)$ and vertical

18. with x-intercept 3 and y-intercept 9

 19. parallel to $y = 5x - 6$, through $(8, 4)$

 20. parallel to $5x - y = 13$, through $(6, -4)$

 21. perpendicular to $y = 5x - 4$, through $(2, 2)$

Answers:

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

4. $(x-3)^3(x-4)(x+1)$ 5. $5x^2(x-5)^3(2x+1)(x^2-9x-2)$ 6. $\frac{x}{(x-3)^2}$ 7. $\frac{-(x^2-2x+4)}{(x-2)^2(x^2+4)}$

8. $x(x-1)$ 9. $\frac{x+2}{x}$ 10. $\frac{-1}{x^2-5x+7}$ 11. $\frac{x+1}{3x+2}$ 12. $\frac{x+3}{(x-3)(x+1)}$

13. $y-1 = -\frac{7}{5}(x-7)$ or $y-8 = -\frac{7}{5}(x-2)$ or $7x+5y=54$ 14. $y-7 = -\frac{13}{4}x$ or $y+6 = -\frac{13}{4}(x-4)$ or

15. $y-2 = \frac{1}{4}(x-8)$ or $y = \frac{1}{4}x$ or $x-4y=0$ 16. $y=6$ 17. $x=5$ 18. $y-9=-3x$ or

19. $y-4=5(x-8)$ or $5x-y=36$ 20. $y+4=5(x-6)$ or $5x-y=34$

21. $y-2 = -\frac{1}{5}(x-2)$ or $x+5y=12$

0.3.1 - Logarithm and Exponential Expressions and Equations

Simplify each expression.

1. $\log_2 16$

2. $\ln e^5$

3. $\log_5 1$

4. $4^{\log_4 3}$

5. $\log_3 \sqrt{27}$

6. $10^{2\log 5}$

7. $\ln 1$

8. $\log_3 \left(\frac{1}{81} \right)$

9. $e^{\ln 4}$

10. $\log 10$

11. $\ln e$

12. $\log_4 4$

13. $\ln \sqrt{e}$

14. $\log_{49} \sqrt[3]{7}$

15. $\log_3 3^5$

16. $\log_4 2 + \log_4 8$

17. $\log_4 128 - \log_4 8$

Solve each equation for x.

18. $\log_2 x = 5$

19. $\log_9 x = \frac{3}{2}$

20. $\log x + \log(x-3) = 1$

21. $5^{3x-1} = 25^{x+1}$

22. $4^{2x-1} = 8^{\frac{x}{3}}$

23. $2^x = 5$

Answers:

1. 4

2. 5

3. 0

4. 3

5. $\frac{3}{2}$

6. 25

7. 0

8. -4

9. 4

10. 1

11. 1

12. 1

13. $\frac{1}{2}$

14. $\frac{1}{6}$

15. 5

16. 2

17. 2

18. 32

19. 27

20. 5

21. 3

22. $\frac{2}{3}$

23. $\frac{\ln 5}{\ln 2}$ or $\log_2 5$

0.3.2 - Trigonometric Expressions and Equations

Determine the exact value of each expression.

1. $\sin(60^\circ)$

2. $\cos\left(\frac{\pi}{4}\right)$

3. $\sec(30^\circ)$

4. $\tan\left(\frac{\pi}{4}\right)$

5. $\csc\left(\frac{\pi}{6}\right)$

6. $\cos\left(\frac{3\pi}{4}\right)$

7. $\tan\left(\frac{7\pi}{6}\right)$

8. $\sin(3\pi)$

9. $\sec(270^\circ)$

10. $\sin\left(-\frac{\pi}{6}\right)$

Find the exact value of x for $0 \leq x \leq 360^\circ$.

11. $\cos x = -\frac{\sqrt{3}}{2}$

12. $\tan x = 1$

13. $\sin x = \frac{\sqrt{3}}{2}$

14. $\csc x = -\sqrt{2}$

Find the exact value of x for $0 \leq x \leq 2\pi$.

15. $\cot x = -\frac{1}{\sqrt{3}}$

16. $\sin x = -\frac{1}{2}$

17. $\cos x = 0$

18. $\sec x = -\frac{2}{\sqrt{3}}$

Use a calculator to find the value, to three decimal places, of x for $0 \leq x \leq 360^\circ$.

19. $\sin x = -\frac{1}{4}$

20. $\tan x = -0.65$

21. $\sec x = 3$

22. $\cot x = \frac{3}{2}$

Answers:

- | | | | | | | |
|---|--|--|---|--|--------------------------|-------------------------|
| 1. $\frac{\sqrt{3}}{2}$ | 2. $\frac{1}{\sqrt{2}}$ | 3. $\frac{2}{\sqrt{3}}$ | 4. 1 | 5. 2 | 6. $-\frac{1}{\sqrt{2}}$ | 7. $\frac{1}{\sqrt{3}}$ |
| 8. 0 | 9. Undefined | 10. $-\frac{1}{2}$ | 11. $x = 210^\circ, 330^\circ$ | 12. $x = 45^\circ, 225^\circ$ | | |
| 13. $x = 60^\circ, 120^\circ$ | 14. $x = 225^\circ, 315^\circ$ | 15. $x = \frac{2\pi}{3}, \frac{5\pi}{3}$ | 16. $x = \frac{7\pi}{6}, \frac{11\pi}{6}$ | | | |
| 17. $x = \frac{\pi}{2}, \frac{3\pi}{2}$ | 18. $x = \frac{5\pi}{6}, \frac{7\pi}{6}$ | | | 19. $x = 194.478^\circ, 345.522^\circ$ | | |
| 20. $x = 146.976^\circ, 326.976^\circ$ | 21. $x = 70.529^\circ, 289.471^\circ$ | | | 22. $x = 33.690^\circ, 213.690^\circ$ | | |