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Topics

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2. Fractional Exponents
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21. Intercepts
22. Equations of lines
23. Pythagorean Theorem
24. Common Algebraic Errors

Name _____

1: Exponent Rules

Simplify the following

1. $(-2^2)^3$

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

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

4. $\frac{y^{-4}}{5x^{-2}}$

5. $\frac{x^{-1}y}{xy^{-2}}$

6. $\frac{3xy^9}{2y^{-2}} \cdot \frac{-7y}{42x^5}$

2: Fractional Exponents

Evaluate the following without a calculator

1. $8^{\frac{2}{3}}$

2. $4^{\frac{1}{2}}$

3. $(\sqrt[4]{16})^2$

4. $\sqrt[3]{1000^2}$

5. $(\sqrt[3]{-27})^4$

6. $-(25^{\frac{3}{2}})$

3: Simplifying Radicals

Simplify and rationalize the following.

1. $\sqrt{80}$

2. $\sqrt[4]{32}$

3. $\sqrt[3]{54x^3}$

4. $\frac{3}{\sqrt{8}}$

5. $\sqrt{\frac{4}{75}}$

6. $4\sqrt{3} \cdot \sqrt{21}$

4: Factoring by GCF

Factor the following completely

1. $3x^4 - 9x^2$

2. $49xy + 28x - 14y$

3. $18x^3y^5 - 12x^4y^2$

5: Factoring Quadratic Expressions

Factor the following completely

1. $x^2 - 3x + 2$

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

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

4. $3x^2 - 8x + 4$

5. $3x^2 + 17x + 10$

6. $10x^2 - 19x + 6$

6: Special Factoring

$$a^2 + 2ab + b^2 = (a+b)^2 \quad a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^2 - 2ab + b^2 = (a-b)^2 \quad a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$a^2 - b^2 = (a+b)(a-b)$$

Factor the following completely

1. $4x^2 - 20x + 25$

2. $49x^2 + 42xy + 9y^2$

3. $16x^4 - 81$

4. $x^3 - 8$

5. $125x^3 + y^3$

6. $64 - 27y^6$

7: Factoring through Synthetic Division

Use synthetic division to factor as indicated.

1. $x^3 - 4x^2 + 2x + 1 = (x-1)(\quad)$

2. $2x^3 + 5x + 7 = (x+1)(\quad)$

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

4. $4x^4 + 3x^2 - 1 = (2x-1)(\quad)$

8: Solving Linear Equations

Solve the following for the unknown variable.

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

2. $\frac{x}{2} + \frac{5x}{6} = \frac{2x}{3} + \frac{1}{12}$

3. $3(x-8) + 4x = 5x - (x+7)$

9: Solving Quadratic Equations by Factoring

Factor to solve for x.

1. $x^2 + 5x + 6 = 0$

2. $8x^2 - 6x - 5 = 0$

3. $11x^2 - 14x - 16 = 0$

10: Solving Quadratic Equations using the Quadratic Formula

For each equation, solve for the indicated expression.

1. $2x^2 - 4x - 1 = 0$ for x

2. $2x^2 + 2x + 3 = 0$ for x

3. $x^4 - 4x^2 + 2 = 0$ for x^2

11: Solving Radical Equations

Solve the following for x .

1. $\sqrt{x} = 3x - 1$

2. $3\sqrt{2x+1} = 7$

3. $3x^{\frac{3}{4}} - 5 = 19$

12: Solving Rational Equations

Solve the following for x

1. $\frac{3}{2x} - \frac{9}{2} = 6x$

2. $\frac{2}{3x} + \frac{2}{3} = \frac{8}{x+6}$

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

13: Solving Logarithmic Equations

Solve the following for x

1. $\log_3 3^x = 7$

2. $\log_9 x = \frac{1}{2}$

3. $2\log_3(x+1) = 4$

14: Function Notation

Given $f(x) = -x^2 + x$, answer the following questions.

1. Find $f(0)$

2. Find $f(x) = 0$

3. Find $f\left(-\frac{1}{3}\right)$

Given $f(x) = \frac{1}{3}x + \frac{7}{4}$, answer the following questions.

4. Find the zeros of $f(x)$

5. Solve $f(x) = \frac{1}{8}$

6. Find $f\left(-\frac{9}{8}\right)$

15: Function Names

Match the following equations to their description.

____ 1. $f(x) = \frac{2}{3}|4x+5| - 3$

____ 2. $f(x) = \frac{2}{3}\sqrt[3]{4x+5} - 3$

____ 3. $f(x) = \frac{2}{3} \cdot \frac{1}{4x+5} - 3$

____ 4. $f(x) = \frac{2}{3}(4x+5)^4 - 3(4x+5)^2 - 2$

____ 5. $f(x) = \frac{2}{3}(4x+5)^3 - 3$

____ 6. $f(x) = \frac{2}{3}(4x+5) - 3$

____ 7. $f(x) = \frac{2}{3}(4x+5)^2 - 3$

____ 8. $f(x) = \frac{2}{3}\sqrt{4x+5} - 3$

A. Linear Function

B. Quadratic Function

C. Absolute Value Function

D. Cubic Function

E. Cube Root Function

F. Square Root Function

G. Rational Function

H. Polynomial Function

16: Function Operations

Perform the following function operations if $f(x) = 2x^2$ and $g(x) = 3 - 4x$

1. $f(g(x))$

2. $g(f(x))$

3. $(f - g)(x)$

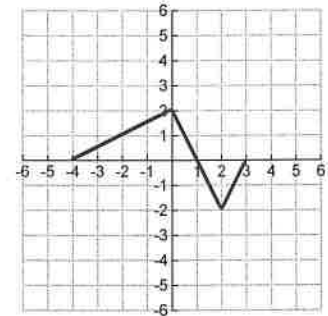
4. $f(f(x))$

5. $g(g(x))$

6. Find $g(g(x)) = 0$

17: Function Transformation

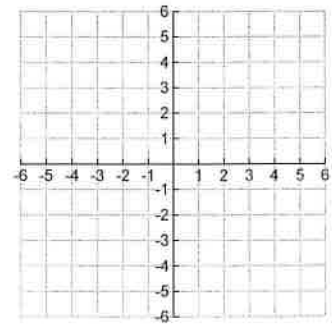
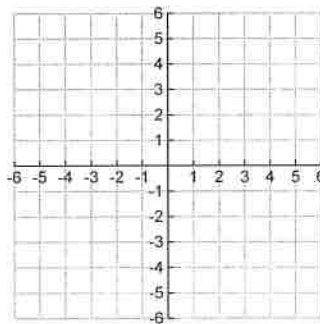
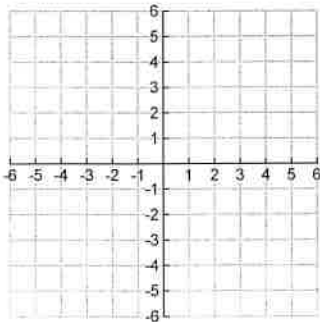
Use the graph of $y = f(x)$ at the right to sketch the following transformations.



1. $y = 2f(x)$

2. $y = -f(x)$

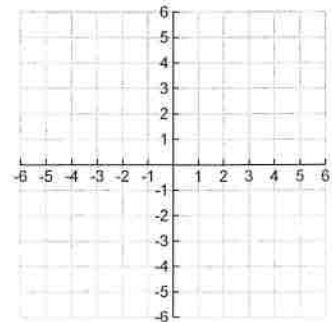
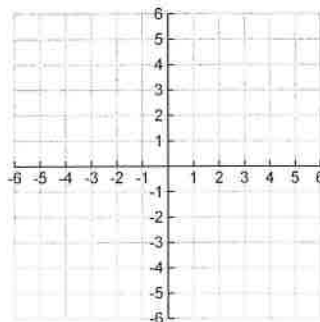
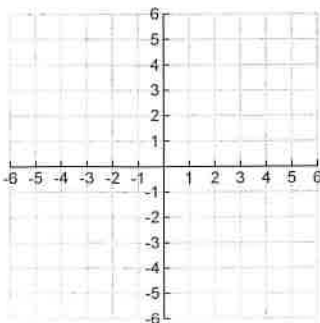
3. $y = f(x-1)$



4. $y = f(x) + 2$

5. $y = f(-x)$

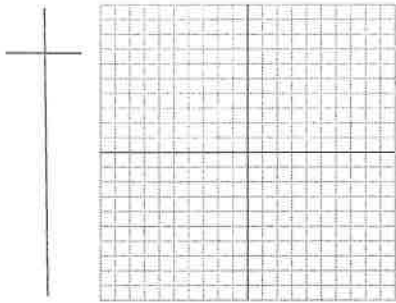
6. $y = -2f(x+2) + 1$



18: Graphing Parent Functions using T-Charts

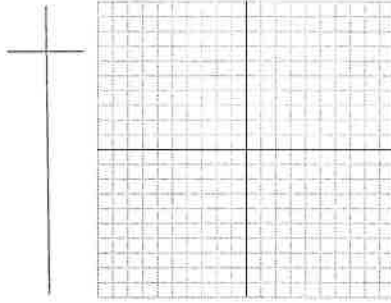
Graph the following using a T-Chart with "smart" values. State the Domain and Range of each function.

1. $f(x) = x^2$



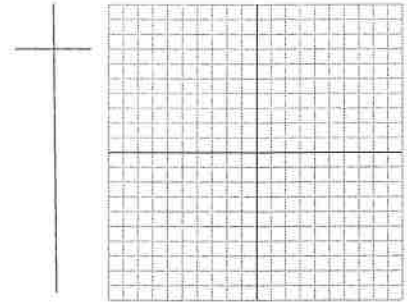
D: R:

2. $f(x) = \sqrt{x}$



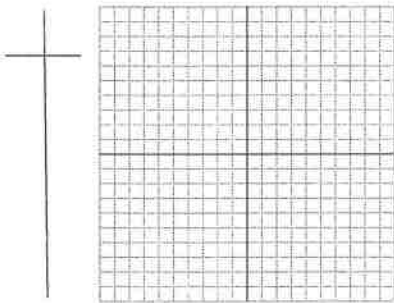
D: R:

3. $f(x) = |x|$



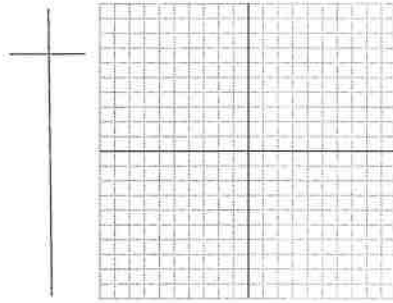
D: R:

4. $f(x) = x^3$



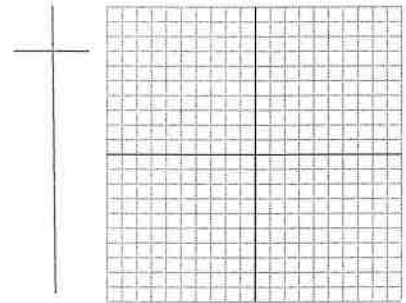
D: R:

5. $f(x) = \sqrt[3]{x}$



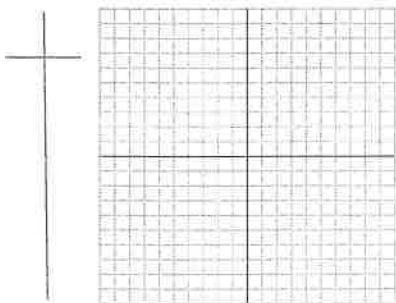
D: R:

6. $f(x) = \frac{1}{x}$



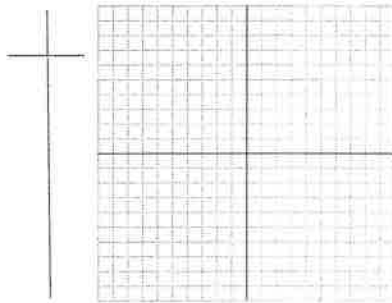
D: R:

7. $f(x) = x$



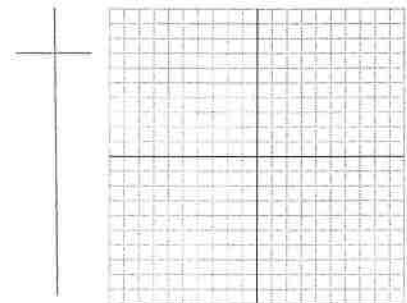
D: R:

8. $f(x) = 2^x$



D: R:

9. $f(x) = \log_2 x$



D: R:

19: Basic Graphing Choosing "Smart" Points

Fill in the T-chart using at least 3 smart x-values (that enable you to find exact points)

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



2. $f(x) = \frac{7}{x-2}$



3. $f(x) = 3^{\frac{x}{4}}$



20: Distance and Midpoint Formulas

Find the distance between the two points. Then find the midpoint between the two points.

1. $(-2, 5); (6, -1)$

2. $\left(\frac{3}{2}, -\frac{1}{2}\right); \left(-\frac{3}{2}, \frac{7}{2}\right)$

3. $\left(\frac{5}{2}, -\frac{3}{2}\right); (1, -4)$

21: Intercepts

Use the following equations to find the x and y intercept(s)

1. $y^2 = x + 9$

2. $9x^2 + 4y^2 = 36$

3. $\left(\frac{x+4}{2}\right)^2 + y^2 = 1$

22: Equations of Lines

Find the equation of the line that has the given characteristics. Leave your answer in the form indicated.

1. $slope = \frac{3}{4}; y\text{-int} : -\frac{2}{3}$

(Standard Form)

2. Parallel to $2x + 3y = 4$ through

$(-3, 6)$

(Slope-intercept form)

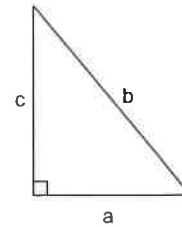
3. Perpendicular to $4x - 7y = 23$

through $\left(\frac{2}{3}, -\frac{4}{5}\right)$

(Point-Slope Form)

23: Pythagorean Theorem

Use the diagram at the right to answer the following questions. Be sure to simplify.



1. Find b if $a = 4\sqrt{5}$, $c = 2$
2. Find c if $a = 2\sqrt{3}$, $b = 6$
3. If $a = c$, and $b = 10$, find a

24: Algebraic Errors to Avoid

Error	Correct form	Comments
$a - (x - b) \neq a - x - b$	$a - (x - b) = a - x + b$	Change all signs when distribution negative through parentheses.
$(a + b)^2 \neq a^2 + b^2$	$(a + b)^2 = a^2 + 2ab + b^2$	Don't forget middle term when squaring binomials.
$\left(\frac{1}{2}a\right)\left(\frac{1}{2}b\right) \neq \frac{1}{2}ab$	$\left(\frac{1}{2}a\right)\left(\frac{1}{2}b\right) = \frac{1}{4}(ab)$	$1/2$ occurs twice as a factor.
$\frac{a}{x + b} \neq \frac{a}{x} + \frac{a}{b}$	Leave as $\frac{a}{x + b}$	Don't add denominators when adding fractions.
$\frac{1}{a} + \frac{1}{b} \neq \frac{1}{a + b}$	$\frac{1}{a} + \frac{1}{b} = \frac{a + b}{ab}$	Use definition for adding fractions.
$\frac{x}{a} \neq \frac{bx}{a}$	$\frac{x}{b} = \left(\frac{x}{a}\right)\left(\frac{1}{b}\right) = \frac{x}{ab}$	Multiply by reciprocal of the denominator.
$\frac{1}{3x} \neq \frac{1}{3}x$	$\frac{1}{3x} = \frac{1}{3} \cdot \frac{1}{x}$	Use definition for multiplying fractions.
$1/x + 2 \neq \frac{1}{x + 2}$	$1/x + 2 = \frac{1}{x} + 2$	Be careful when using a slash to denote division.
$(x^2)^3 \neq x^5$	$(x^2)^3 = x^{2 \cdot 3} = x^6$	Multiply exponents when an exponential form is raised to a power.
$2x^3 \neq (2x)^3$	$2x^3 = 2(x^3)$	Exponents have priority over coefficients.
$\frac{1}{x^2 + x^3} \neq x^{-2} + x^{-3}$	Leave as $\frac{1}{x^2 + x^3}$	Don't shift term-by-term from denominator to numerator.
$\sqrt{5x} \neq 5\sqrt{x}$	$\sqrt{5x} = \sqrt{5}\sqrt{x}$	Radicals apply to every factor inside radical.
$\sqrt{x^2 + a^2} \neq x + a$	Leave as $\sqrt{x^2 + a^2}$	Don't apply radicals term-by-term.
$\frac{a + bx}{a} \neq 1 + bx$	$\frac{a + bx}{a} = 1 + \frac{b}{a}x$	Cancel common factor, <i>not</i> common terms.
$\frac{a + ax}{a} \neq a + x$	$\frac{a + ax}{a} = 1 + x$	Factor <i>before</i> canceling.

Multiplying Polynomials
No Calculator!!!

1. $(x+7)^2$

2) $(x-11)^2$

3. $(x+4)^3$

4. $(x+h)^3$

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

6. $(x+h)(x^2+3xh+8)$

7. $(a+b)^2$

Factoring
No Calculator!!

Factor each polynomial completely. If the polynomial cannot be factored write prime.

1) $2x^2 - 128$

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

3) $a^3 - 64b^3$

4) $5x^2 + 40x - 10$

5) $2x^2 - 11x + 12$

6) $x^3 + 16x^2 + 64x$

7) $x^3 + 3x^2 - 4x - 12$

8) $24x^2 - 54$

9) $6x^3 - 18x^2$

10) $5c^2 + 4cd - d^2$

11) $27y^3 + 125$

12) $20x^2 - 4x - 72$

13) $-x^2 + 100$

14) $4x^4 - 64$

15) $a^4 - 2a^2 + 1$

16) $9x^3 + 12x^2 - 45x$

17) $n^2 - 2n - np + 2p$

18) $24x^2 + 4x - 60$

Adding and Subtracting Fractions
No Calculator!!!

Simplify each expression.

1. $\frac{2}{3} + \frac{5}{7}$

2. $\frac{1}{6} - \frac{5}{18}$

3. $\frac{6}{x} + 5$

4. $\frac{3x}{4y} - 7$

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

6. $\frac{x}{x+5} + \frac{7x}{x^2-25}$

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

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

9. $\frac{x}{x^2-9} + \frac{5}{4x-12}$

10. $\frac{5x}{x-5} + \frac{x+5}{x+2}$

11. $\frac{3}{x+3} - \frac{4}{3x}$

Multiplying and Dividing Fractions
No Calculator!!!

Simplify each expression.

$$1. \frac{4}{5} \cdot \frac{2}{3}$$

$$2. \frac{1}{9} \cdot \frac{3}{7}$$

$$3. \frac{\frac{2}{7}}{\frac{4}{9}}$$

$$4. \frac{\frac{11}{7}}{\frac{7}{18}}$$

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

$$6. \frac{x}{\frac{5}{3}}$$

$$7. \frac{4}{13} \cdot \frac{x}{7}$$

$$8. \frac{x+2}{5x} \cdot \frac{-7}{4x}$$

$$9. \frac{11}{10} \cdot 9x$$

$$10. \frac{\frac{8}{3x}}{\frac{5x}{7}}$$

$$11. \frac{\frac{7x+2}{5x-3}}{\frac{9x+4}{6x+7}}$$

$$12. \frac{\frac{x}{2}}{\frac{5}{5}}$$

$$13. \frac{\frac{y}{z}}{7}$$

$$14. \frac{2 + \frac{3}{7}}{4 - \frac{1}{7}}$$

Remember you cannot cancel at the beginning!!!

$$15. \frac{1 + \frac{1}{x}}{1 - \frac{1}{x}}$$

$$16. \frac{\frac{x}{3} - 4}{\frac{x}{3} + 7}$$

Rationalize the denominator
No Calculator!!

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

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

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

4) $\frac{2+\sqrt{2}}{6+\sqrt{2}}$

5) $\frac{3i-2}{5i-3}$

6) $\frac{6-i\sqrt{2}}{6+i\sqrt{2}}$

7) $\frac{3+7i}{7i}$

Solve Quadratic Equations
No Calculator!!

Find all real and imaginary solutions for all problems.

Solve the following by factoring.

1) $x^2 = 3x + 4$

2) $9x = 10x^2$

3) $8x^2 + 2x = 1$

4) $x(x-5) = 36$

5) $(x-6)(x-8) = 24$

Solve the following by using the square root property.

6) $3x^2 + 2 = 0$

7) $(x+5)^2 - 12 = 0$

8) $(2x-5)^2 = -11$

9) $5(4x-3)^2 = 30$

10) $\frac{(y+4)^2}{2} = 18$

Solve the following by completing the square.

11) $x^2 + 10 = 8x$

12) $x^2 - 5x + \frac{41}{4} = 0$

13) $2x^2 + 16x + 39 = 0$

Solve the following using the Quadratic Formula. You should have the Quadratic Formula memorized.

14) $3x^2 = 2 - 9x$

15) $5x^2 - 2x = -4$

16) $12x^2 = x + 6$

Find the domain of functions

No Calculator!!

State the domain of each function using interval notation.

1) $f(x) = \sqrt{2x-5}$

2) $f(x) = \frac{x}{5-x}$

3) $f(x) = 4x+5$

4) $f(x) = 3x^2 - 4x + 9$

5) $f(x) = \frac{x}{x+4}$

6) $f(x) = \sqrt{-2x+5}$

7) $f(x) = \frac{1}{3x^2 - 27}$

8) $f(x) = \frac{1}{x^2 - 10x + 24}$

Rational Equations
No Calculator!!!

Remember the quadratic formula!!!
Solve each rational equation.

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

2. $4 = \frac{5}{x} + \frac{2}{3}$

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

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

5. $\frac{2}{x+5} + \frac{6}{x^2-25} = \frac{3}{x-5}$

6. $\frac{13x+20}{x^2+13x+42} - \frac{4}{x+6} = \frac{6}{x+7}$

Logarithms
No Calculator!!!

Write each equation in logarithmic form.

1. $4^2 = 16$

2. $5^{-3} = \frac{1}{125}$

Write each equation in exponential form.

3. $\log_3 81 = 4$

4. $\log_{49} 7 = \frac{1}{2}$

Evaluate each expression.

5. $\log 100$

6. $\log_2 32$

7. $\log_3 \frac{1}{81}$

8. $\log_{64} 4$

9. $\log_5 5^8$

Solve each equation.

10. $\log_7 x = 3$

11. $\log_8 (5x - 11) = 2$

12. $\log_x 6 = \frac{1}{2}$

13. $\log_3 \frac{1}{27} = x$

14. $\log_4 x + 3 = \log_4 (5x^2)$

15. $\log 125 = 3 \log x$

16. $2 \log_9 3 - \log_9 5 = \log_9 x$

17. $\log_4 x + \log_4 2 = 3$

18. $\log_3(x+1) - \log_3(x-1) = 4$