

* Precalculus Summer Packet -

Use www.google.com to search for skill-related videos on any of these topics.

Use www.khanacademy.org to find specific math related topics with accompanying videos.

Use www.wolframalpha.com to see step by step answers for specific questions you may have.

Topics

Exponents

1. Basic Rules
2. Fractional Exponents
3. Simplifying Radicals

Factoring

4. Factoring by GCF
5. Factoring quadratic expressions
6. Special Factoring formulas
7. Factoring through synthetic division

Equations/Inequalities

8. Solving linear equations.
9. Solving quadratic equations by factoring
10. Solving quadratic equations by quadratic formula
11. Solving radical equations
12. Solving rational equations
13. Solving logarithmic equations

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15. Function names
16. Function Operations.

Graphing

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General Topics

20. Distance and Midpoint formulas
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. $\sqrt[3]{32}$

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

$$\begin{aligned} a^2 + 2ab + b^2 &= (a+b)^2 & a^3 + b^3 &= (a+b)(a^2 - ab + b^2) \\ a^2 - 2ab + b^2 &= (a-b)^2 & a^3 - b^3 &= (a-b)(a^2 + ab + b^2) \\ a^2 - b^2 &= (a+b)(a-b) \end{aligned}$$

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. $(f-g)(x)$

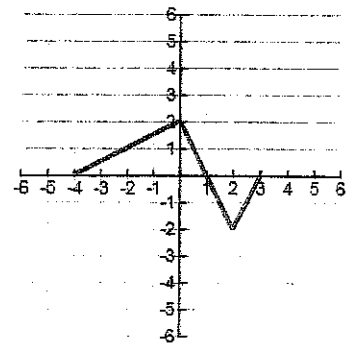
4. $f(f(x))$

5. $g(g(x))$

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

17: Function Transformation

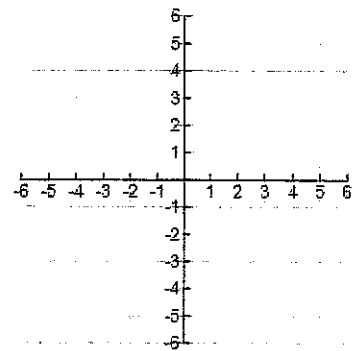
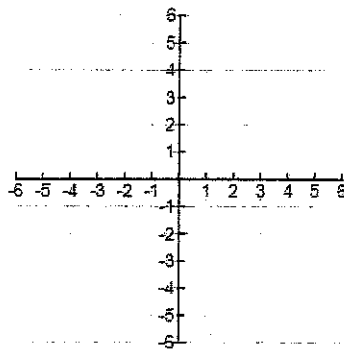
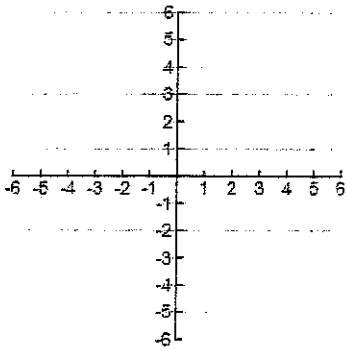
Use the graph of $y = f(x)$ at the right to sketch the following transformations.



1. $y = 2f(x)$

2. $y = -f(x)$

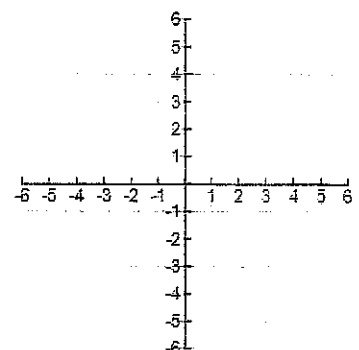
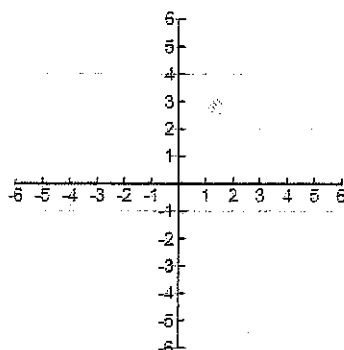
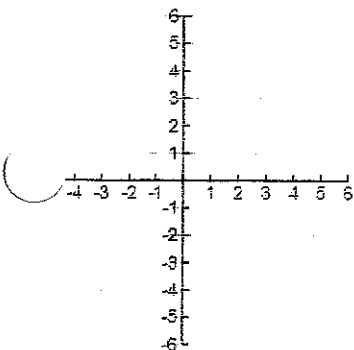
3. $y = f(x-1)$



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

5. $y = f(-x)$

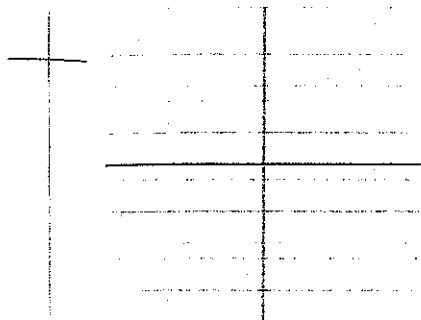
6. $y = -2f(x+2) + 1$



18: Graphing Parent Functions using T-Charts

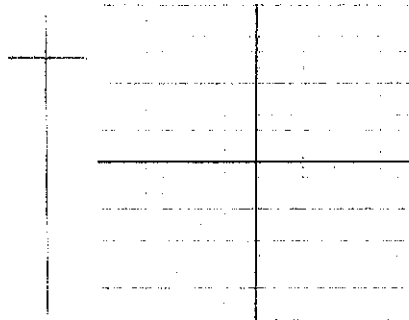
Graph the following using a T-Chart with "smart" values. State the Domain and Range of each function.

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



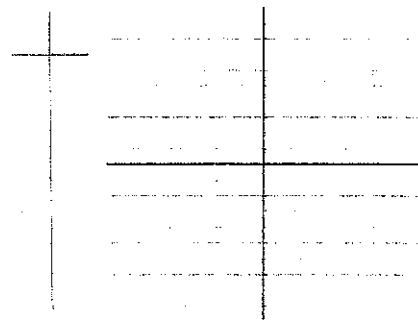
D: R:

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



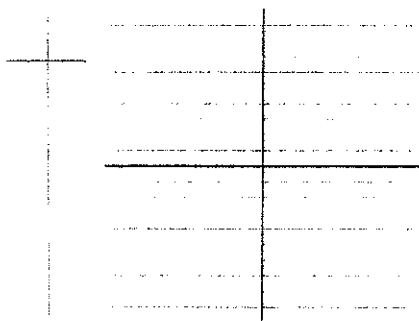
D: R:

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



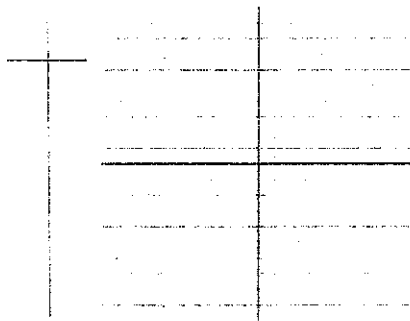
D: R:

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



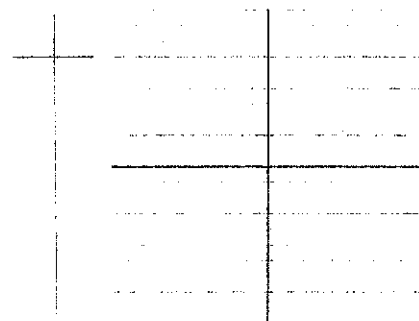
D: R:

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



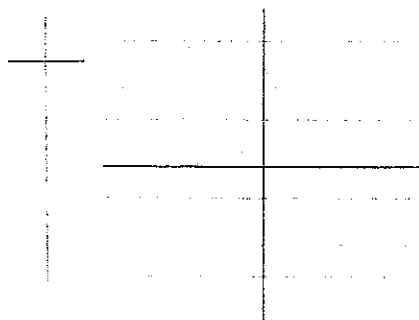
D: R:

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



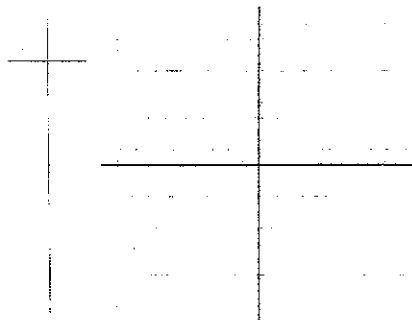
D: R:

7. $f(x) = x$



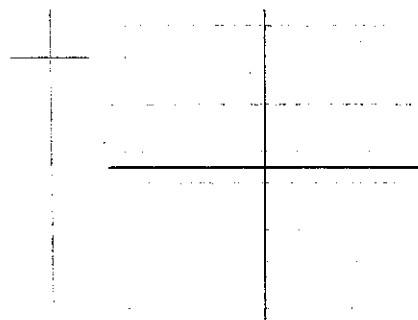
D: R:

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



D: R:

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



D: R:

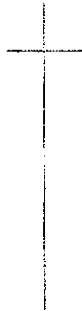
19: Basic Graphing Choosing "Smart" Points

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-int: $-\frac{2}{3}$

(Standard Form)

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

$(-3, 6)$

(Slope-intercept form)

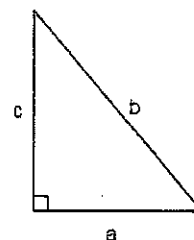
3. Perpendicular to $4x - 7y = 23$

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.