

Topic: Expressions & Operations All.1

All.1 The student will identify field properties, axioms of equality and inequality, and properties of order that are valid for the set of real numbers and its subsets, complex numbers and matrices.

Notes and/or Formulas

Properties

Identity Property

(+) $a + 0 = a$

(x) $a(1) = a$

Inverse Property

(+) $a + (-a) = 0$

(x) $a \cdot \frac{1}{a} = 1$

Associative Property

(+) $a + (b + c) = (a + b) + c$

(x) $a(bc) = (ab)c$

Commutative Property

(+) $a + b = b + a$

(x) $ab = ba$

Distributive Property

$a(b + c) = ab + ac$

Axioms of Equality

Reflexive

$a = a$

Symmetric

If $a = b$, then $b = a$

Transitive

If $a = b$, and $b = c$
then $a = c$

Order of Operations

Parenthesis

Exponent

Multiply*

Divide*

Add**

Subtract**

* Multiply/Divide in order from left to right

** Add/Subtract in order from left to right

1. Which of the following is an example of the commutative property of addition?
 - A. $a + b = a + b$
 - B. $a + (b + c) = (a + b) + c$
 - C. $a + (b + c) = a + (c + b)$
 - D. $ab + c = a + bc$

2. Which property justifies the statement $x(a + c) = xa + xc$?
 - F. Associative Property of Multiplication
 - G. Commutative Property of Multiplication
 - H. Associative Property of Addition
 - J. Distributive Property

3. For which of the following operations is the commutative property *not* valid?
 - A. Multiplication of integers
 - B. Multiplication of complex numbers
 - C. Multiplication of matrices
 - D. Multiplication of negative real numbers

4. Use the distributive property to simplify: $7(2x + 5y)$
 - F. $2x + 5y$
 - G. $14x - 35y$
 - H. $14x + 5y$
 - J. $14x + 35y$

5. Use the distributive property to simplify: $9(6x - 4y)$
 - A. $54x - 36y$
 - B. $54x - 4y$
 - C. $6x - 36y$
 - D. $6x - 4y$

6. Simplify: $(54 + 3 \cdot 48 \div 3 - 48) \div 9$
 - F. 3
 - G. 6
 - H. 2700
 - J. 106

7. Simplify: $10 \div 5 + 3(8 - 2)$
 - A. 36
 - B. 48
 - C. 20
 - D. 14

8. Solve the equation by using the properties of equalities: $3(x+2) = -8$

F. $-\frac{14}{3}$

G. $\frac{14}{3}$

H. $\frac{10}{3}$

J. $-\frac{10}{3}$

9. Solve the equation by using the properties of equalities: $7+5(x-3) = 2x+7$

A. $x = 5$

B. $x = -5$

C. No Solution

D. Identity

10. If $a < 4$, which of the following statement is true?

F. $a+3 < 7$

G. $4a > 16$

H. $4a < 14$

J. $a-5 < 10$

Topic: Expressions & Operations All.5

All.5 The student will identify and factor completely polynomials representing the difference of squares, perfect trinomials, the sum and difference of cubes and general trinomials.

Notes and/or Formulas

Ways to Factor:

1) Greatest Common Factor

$$xy + xw = x(y + w)$$

2) Difference of Squares

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

3) Sum of Cubes*

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

4) Difference of Cubes*

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

*Square-Multiply-Square-
Opposite +Plus

5) Trinomials

6) Factor by Grouping (leading coefficient)

7) Completing the square

1. Which is the factored form of $64x^3 + 1$?

- A. $(4x + 1)(4x^2 + 4x + 1)$
- B. $(4x + 1)(16x^2 + 1)$
- C. $(4x + 1)(16x^2 - 4x + 1)$
- D. $(4x + 1)(16x^2 + 4x + 1)$

2. Factor: $x^2 - 100$

- F. $(x - 50)(x + 50)$
- G. $(x - 10)(x - 10)$
- H. $(x - 10)(x + 10)$
- J. $(x - 25)(x - 4)$

3. Factor: $9x^6 - 21x^9$

- A. $3(3x^6 - 7x^9)$
- B. $3x^5(3x - 7x^8)$
- C. $3x^6(3 - 7x^3)$
- D. $x^6(9 - 21x^3)$

4. Factor: $2x^2 - 7x - 4$

- F. $(2x - 1)(x + 4)$
- G. $(2x + 4)(x - 1)$
- H. $(2x + 1)(x - 4)$
- J. $(2x - 1)(x - 4)$

5. Factor: $x^2 + 3x + 2$

- A. $(x - 1)(x - 2)$
- B. $(x + 1)(x + 2)$
- C. $(x - 1)(x + 2)$
- D. $(x + 3)(x + 2)$

6. Factor: $18u^2 + 3u - 1$

- F. $(6u + 1)(3u - 1)$
- G. $(6u - 1)(3u - 1)$
- H. $(6u + 1)(3u + 1)$
- J. $(6u - 1)(3u + 1)$

Notes and/or Formulas

7. $2x^2 + 5x - 12$ represents the area of a rectangle. Which of the following could represent the length of one side of the rectangle?
- A. $2x + 3$
 - B. $2x - 3$
 - C. $x - 4$
 - D. $x + 12$
8. $3x^2 - 5x + 2$ represents the area of a rectangle. Which of the following could represent the length of one side of the rectangle?
- F. $3x + 2$
 - G. $x + 1$
 - H. $3x - 2$
 - J. $x - 2$
9. Factor: $b^3 - 64$
- A. $(b - 4)^3$
 - B. $(b - 4)(b - 4)(b - 4)$
 - C. $(b - 4)(b^2 + 4b + 16)$
 - D. $(b - 4)(b^2 - 4b + 16)$
10. Find the term that must be added to both sides of the equation so that the equation can be solved by the method of completing the square $x^2 + 8x = 13$
- F. 16
 - G. 64
 - H. -13
 - J. 32
11. Find the term that must be added to both sides of the equation so that the equation can be solved by the method of completing the square $x^2 + 6x = 9$
- A. 18
 - B. 9
 - C. 36
 - D. -9

Topic: Expressions & Operations All.2

All.2 The student will add, subtract, multiply, divide, and simplify rational expressions, including complex fractions.

Notes and/or Formulas

Rules for fractions:

- 1) Always factor any squared terms completely – watch for greatest common factors
- 2) Addition & Subtraction of fractions require a common denominator
- 3) When dividing fractions – flip the second fraction and multiply
- 4) Complex Fractions – simplify numerator, simplify the denominator, then Divide

1. Simplify: $\frac{a+2}{2a} + \frac{1-a}{a^2}$

A. $\frac{a^2+2}{2a^2}$

B. $\frac{a^2+2}{2a^3}$

C. $\frac{a+1}{a}$

D. $\frac{a+2}{2a}$

2. Simplify: $\frac{1-\frac{x}{y}}{\frac{1}{x}-\frac{1}{y}}$

F. $\frac{1}{y}$

G. $\frac{1}{x}$

H. $\frac{y-x}{xy}$

J. x

3. Simplify: $\frac{3m^2+2m-1}{m^2-1}$

A. $3-2m$

B. $3+2m$

C. $\frac{3m-1}{m-1}$

D. $\frac{3m+1}{m-1}$

Notes and/or Formulas

4. Multiply: $\frac{x+1}{4x+y} \cdot \frac{16x^2 - y^2}{2x^2 + 5x + 3}$

F. $\frac{4x^2 - y^2}{2x+3}$

G. $\frac{4x-y}{2x+3}$

H. $\frac{4x+y}{5x+5}$

J. $\frac{4x-y}{5}$

5. Multiply: $\frac{x+4}{3x+4y} \cdot \frac{9x^2 - 16y^2}{2x^2 + 13x + 20}$

A. $\frac{3x-4y}{2x+5}$

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

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

D. $\frac{3x-4y}{7x+13}$

6. Divide: $\frac{2x^2 + 15x + 25}{2x^2 + 13x + 20} \div \frac{x^2 + 7x + 10}{-4x^2 - 24x - 32}$

F. -4

G. -3

H. $x+2$

J. $x+5$

7. Divide: $\frac{2x^2 + x - 3}{2x^2 - 7x - 15} \div \frac{x^2 + 2x - 3}{-4x^2 + 8x + 60}$

A. $x-1$

B. -3

C. -4

D. $x+3$

Notes and/or Formulas

8. Simplify: $\frac{\frac{x^2 + 6x + 9}{20x}}{\frac{x+3}{4x}}$

F. $\frac{x+9}{5x}$

G. $\frac{x-3}{5}$

H. $7x+3$

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

9. Simplify: $\frac{\frac{x^2 - 16x + 64}{24x}}{\frac{x-8}{4x}}$

A. $\frac{x+64}{6x}$

B. $\frac{x+8}{6}$

C. $\frac{x-8}{6}$

D. $-15x-8$

Topic: Expressions & Operations All.17

All.17 The students will perform operations on complex numbers and express the results in simplest form. Simplifying the results will involve using patterns of the powers of i .

Notes and/or Formulas

Calculator (TI-83 or TI-84)
Use i button on the calculator, however remember to use the parentheses to separate operations

EX. $\frac{2+i}{3-i}$
 $(2+i) \div (3-i) =$

Don't Forget: $i^2 = -1$

1. Simplify: $\frac{3-4i}{-2+i}$

- A. $-2+i$
- B. -2
- C. $\frac{-2+11i}{3}$
- D. $\frac{-2+5i}{3}$

2. Simplify: $\frac{3-5i}{7+4i}$

- F. $\frac{1}{65} - \frac{47}{65}i$
- G. $\frac{1}{65} + \frac{47}{65}i$
- H. $-\frac{1}{65} + \frac{47}{65}i$
- J. $-\frac{1}{65} - \frac{47}{65}i$

3. Simplify: $\frac{7+i}{8+i}$

- A. $\frac{-57-i}{65}$
- B. $\frac{57-i}{65}$
- C. $\frac{-57+i}{65}$
- D. $\frac{57+i}{65}$

4. Simplify: $(-2-5i)(8+3i)$

- F. $-31-46i$
- G. $-1+34i$
- H. $-31+34i$
- J. $-1-46i$

5. Simplify: $(1+7i)(-9-4i)$

- A. $-37+59i$
- B. $19+59i$
- C. $19-67i$
- D. $-37-67i$

Notes and/or Formulas

To simplify powers of i
 Change to $(i^2)^{\text{Power}}$ then
 change (i^2) to (-1)

Example

$$\begin{aligned} i^{23} &= (i^2)^{11} \cdot i \\ &= (-1)^{11} \cdot i \\ &= (-1) \cdot i \\ &= -i \end{aligned}$$

Don't Forget: $\sqrt{-1} = i$

6. Simplify: $(3+8i)+(7-6i)$
 - F. $10-2i$
 - G. $10+2i$
 - H. $69+38i$
 - J. $-4+14i$

7. Simplify: $(6-6i)-(1-2i)$
 - A. $7-8i$
 - B. $7+8i$
 - C. $-6-18i$
 - D. $5-4i$

8. Simplify: $(3+4i)+2(5i-6)$
 - F. $-24+13i$
 - G. $-9+14i$
 - H. $-18+14i$
 - J. $5i$

9. Simplify: i^{44}
 - A. 1
 - B. -1
 - C. i
 - D. $-i$

10. Simplify: i^{27}
 - F. 1
 - G. i
 - H. $-i$
 - J. -1

11. Write the given expression in terms of $i\sqrt{-8}$
 - A. $-8i$
 - B. $-2\sqrt{2}i$
 - C. $i\sqrt{8}$
 - D. $2i\sqrt{2}$

12. Write the given expression in terms of $i\sqrt{-64}$
 - F. -8
 - G. $-8i$
 - H. $8i$
 - J. 8

Topic: Expressions & Operations All.3

All.3 The student will add, subtract, multiply, divide, and simplify radical expressions containing radical expressions containing positive rational numbers and variables and expressions containing rational exponents; and write radical expressions as expressions containing rational exponents, and vice versa.

Notes and/or Formulas

Multiplying Radicals

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$$

$$\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$$

1. Simplify: $\sqrt[3]{27y^9}$
 - A. 3
 - B. $3y$
 - C. $3y^3$
 - D. $3y^6$

2. Simplify: $\sqrt[5]{x^{18}y^{22}}$
 - F. $x^3y^4\sqrt[5]{x^3y^2}$
 - G. $x^3y^2\sqrt[5]{x^3y^4}$
 - H. $x^{13}y^{17}\sqrt{xy}$
 - J. $x^3y^4\sqrt{x^3y^2}$

3. Simplify: $\sqrt{6x^5y} \cdot \sqrt{4xy^4}$
 - A. $4x^3y\sqrt{6y}$
 - B. $2xy\sqrt{6}$
 - C. $2x^3y^2\sqrt{6y}$
 - D. $4x^6y^5\sqrt{6}$

4. Simplify: $\sqrt{\frac{6x^5}{3x^6}}$
 - F. $2x$
 - G. $\sqrt{2x}$
 - H. $\frac{2x}{x}$
 - J. $\frac{\sqrt{2x}}{x}$

5. Rationalize the denominator: $\frac{4}{\sqrt{11}}$
 - A. $\frac{\sqrt{4}}{11}$
 - B. $4\sqrt{11}$
 - C. $\frac{4\sqrt{11}}{121}$
 - D. $\frac{4\sqrt{11}}{11}$

Notes and/or Formulas

Only radical expressions with like radicands (stuff under the radical) can be added or subtracted.

6.

Rationalize the denominator: $\frac{\sqrt{x}}{\sqrt{2}}$

F. $\frac{\sqrt{2x}}{4}$

G. $\frac{\sqrt{x}}{2}$

H. $\frac{x}{2}$

J. $\frac{\sqrt{2x}}{2}$

7.

Simplify: $-\sqrt{5} - 2\sqrt{49} + 2\sqrt{20}$ A. $-11\sqrt{5}$ B. $3\sqrt{5} - 14 + 2\sqrt{20}$ C. $3\sqrt{5} - 14$ D. $-\sqrt{74}$

8.

Simplify: $8\sqrt{7} - \sqrt{4} + 6\sqrt{63}$

F. $24\sqrt{7}$

G. $26\sqrt{7} - 2$

H. $13\sqrt{74}$

J. $26\sqrt{7} - 2 + 6\sqrt{63}$

9.

Multiply: $(4 - \sqrt{3})(4 + \sqrt{3})$ A. $19 - 8\sqrt{3}$

B. 19

C. $13 - 8\sqrt{3}$

D. 13

10.

Divide: $\frac{3}{6 - \sqrt{5}}$

F. $18 + 3\sqrt{5}$

G. $\frac{18 + \sqrt{5}}{31}$

H. $\frac{18 + 3\sqrt{5}}{31}$

J. $6 + \sqrt{5}$

Notes and/or formulas

Don't Forget:

$$\sqrt[b]{x^a} = (\sqrt[b]{x})^a = x^{a/b}$$

Properties of Rational Exponent

1. $a^m \cdot a^n = a^{m+n}$

2. $(a^m)^n = a^{mn}$

3. $(ab)^m = a^m b^m$

4. $a^{-m} = \frac{1}{a^m}$

5. $\frac{a^m}{a^n} = a^{m-n}$

6. $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

11. Rewrite $(\sqrt[6]{x})^5$ using rational exponents.

A. $x^{6/5}$

B. $x^{-6/5}$

C. $x^{5/6}$

D. $x^{-5/6}$

12. Rewrite $\sqrt[8]{x^7}$ using rational exponents

F. $x^{-8/7}$

G. $x^{7/8}$

H. $x^{-7/8}$

J. $x^{8/7}$

13. Simplify and write in simplest radical form: $x^{5/2} \cdot x^{1/5}$

A. \sqrt{x}

B. $x^{210}\sqrt{x^7}$

C. x^2

D. $\sqrt[27]{x^{10}}$

14. Simplify and write in simplest radical form: $x^{1/2} \cdot x^{5/3}$

F. $x^2\sqrt[6]{x}$

G. $\sqrt[13]{x^6}$

H. $\sqrt[6]{x^5}$

J. $x^5\sqrt{x}$

15. Simplify: $(-4x^3y^4)(-2x^3y^2)$

A. $8x^9y^8$

B. $-8x^3y^2$

C. $8x^6y^6$

D. $-8x^6y^6$

16. Simplify: $(2x^2y^2)(-6x^2y^4)$

F. $12x^2y^4$

G. $-12x^4y^6$

H. $-12x^4y^6$

J. $12x^4y^6$

Notes and/or Formulas

17. Simplify: $\frac{-27x^7y^3}{-9x^4y^6}$

A. $\frac{x^3}{3y^3}$

B. $\frac{3x^3}{y^3}$

C. $-\frac{3x^3}{y^3}$

D. $\frac{3x^{11}}{y^9}$

18. Simplify: $\frac{32x^7y^2}{-8xy^7}$

F. $\frac{4x^6}{y^5}$

G. $-\frac{4x^6}{y^5}$

H. $-\frac{x^6}{4y^5}$

J. $-\frac{4x^8}{y^9}$

Topic: Equations & Inequalities All.4

All.4 The student will solve absolute value equations and inequalities graphically and algebraically. Graphing calculators will be used both as a primary method of solution and to verify algebraic solutions.

Notes and/or Formulas

To Solve Absolute Value Equations

Set = to positive value

Set = to negative value

To Solve Absolute Value Inequalities

1. Write equation as is
2. Write equation, switch inequality symbol, change to negative value

To Graph Absolute Value Inequalities

Great**OR** Than
Less Th**AND**

OR....

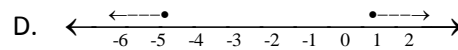
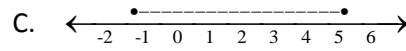
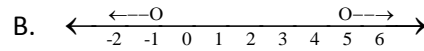
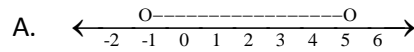
$| >$ (Open – Left & Right)

$| \geq$ (Closed – Left & Right)

$| <$ (Open – Between)

$| \leq$ (Closed – Between)

1. Which graph represents the solution of $|3x - 6| \geq 9$?



2. Solve: $2|x - 2| = 4$

F. $x = 0$ and $x = 4$

G. $x = 4$

H. $x = 0$

J. No Solution

3. Solve: $|4x + 1| = 5$

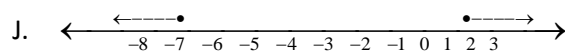
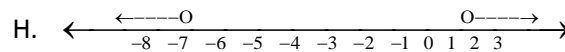
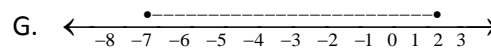
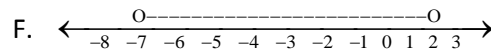
A. $-\frac{3}{2}, 1$

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

C. $-\frac{3}{2}, \frac{3}{2}$

D. $-\frac{3}{2}, -1$

4. Solve and Graph: $|2x + 5| < 9$



Topic: Equations & Inequalities All.6

All.6 The student will select, justify and apply a technique to solve a quadratic equation over the set of complex numbers. Graphing calculators will be used for solving and for confirming the algebraic solutions.

Notes and/or Formulas

Methods for Solving Quadratics

1. Factor
2. Complete the Square
3. Square Root Method
4. Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$\sqrt{\text{negative number}}$ use i

Calculator Hints:

To Find Roots, Solutions, Zeros

1. Graph quadratic in $y =$
2. Press 2nd Trace
3. Press #2 for zeros
4. Left Enter
5. Right Enter
6. (Guess) Enter

1. Solve: $3x^2 + 4x - 4 = 0$

A. $\frac{2}{3}, -2$

B. $-\frac{2}{3}, 2$

C. $4, -12$

D. $2, -3$

2. Solve: $3x^2 + 14 = 8$

F. $2, -2$

G. $2i, -2i$

H. $\sqrt{2}, -\sqrt{2}$

J. $i\sqrt{2}, -i\sqrt{2}$

3. Solve: $x^2 - x - 2 = 0$

A. $-1, 2$

B. $1, 2$

C. $-2, 1$

D. $-1, -2$

4. Solve: $2(x-1)^2 = 8$

F. $3, -1$

G. $2, -2$

H. $1 + \sqrt{2}, 1 - \sqrt{2}$

J. No Solution

5. Solve: $4x^2 + 13x - 12 = 0$

A. $-4, \frac{4}{3}$

B. $-4, \frac{3}{4}$

C. $4, -\frac{3}{4}$

D. $4, -\frac{4}{3}$

Notes and/or Formulas

12. Describe the nature of the roots of the equation $4x^2 + 4x + 5 = 0$

F. Two imaginary roots

G. Two real roots

H. One real root

J. One real root and one imaginary root

Topic: Equations & Inequalities All.7

All.7 The student will solve equations containing rational expressions and equations containing radical expressions algebraically and graphically. Graphing calculators will be used for solving and confirming algebraic solutions.

Notes and/or Formulas

Solve a radical equation
Isolate the radical
Square or cube both sides

1. Solve: $2 - y = \sqrt{y + 4}$
 - A. $y = 0$
 - B. $y = 5$
 - C. $y = 0$ and $y = 5$
 - D. No Solution
2. Solve: $\sqrt{x + 9} + 3 = x$
 - F. $x = -7$
 - G. $x = 7$
 - H. $x = -7$ and $x = 7$
 - J. $x = 0$ and $x = 7$
3. Solve: $\sqrt[3]{4x - 1} = 3$
 - A. $x = 7$
 - B. $x = \sqrt[3]{7}$
 - C. $x = -\frac{13}{7}$
 - D. $x = 7$ and $x = -\frac{13}{2}$
4. Use the quadratic formula to solve: $x^2 + 10x + 41 = 0$
 - F. $5 \pm 4i$
 - G. $-5 \pm 8i$
 - H. $5 \pm 8i$
 - J. $-5 \pm 4i$

Topic: Relations & Functions All.8

All.8 The student will recognize multiple representations of functions (linear, quadratic, absolute value, step and exponential functions) and convert between a graph, table and symbolic form. A transformational approach to graphing will be employed through the use of graphing calculators.

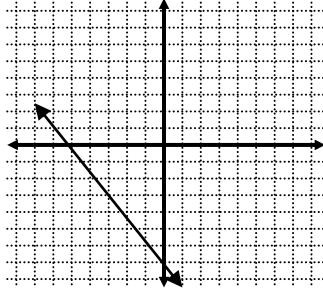
Notes and/or Formulas

To find the x-intercept, plug in zero for y

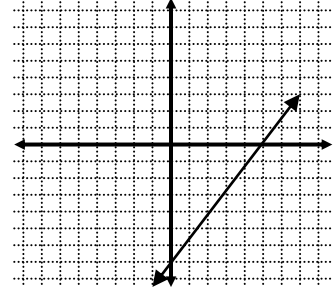
To find the y-intercept, plug in zero for x.

1. Graph $7x + 5y = 35$ by determining its x- and y-intercepts

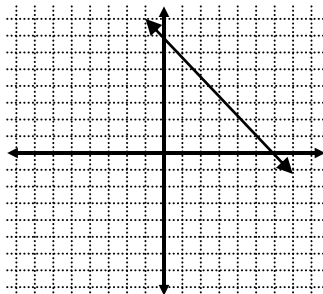
A.



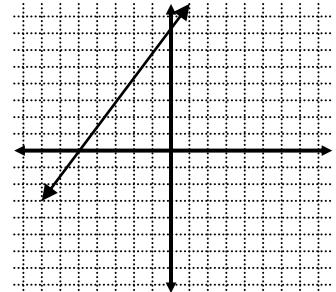
B.



C.

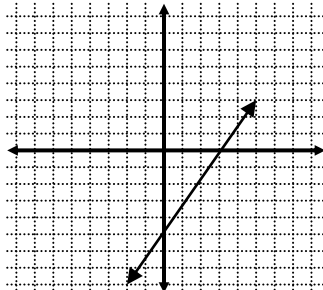


D.

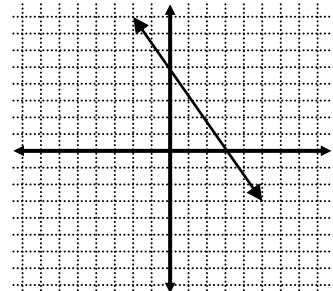


2. Graph $5x + 3y = 15$ by determining its x- and y-intercepts.

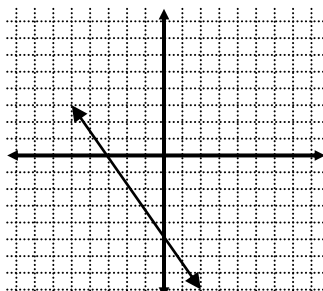
F.



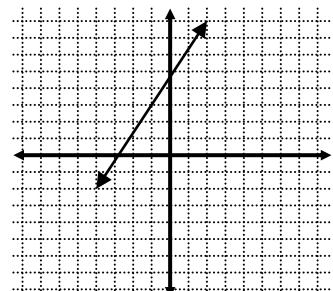
G.



H.



J.



Notes and/or Formulas

$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

For Positive Slope

Count \uparrow , Count \rightarrow
OR

Count \downarrow , Count \leftarrow

For Negative Slope

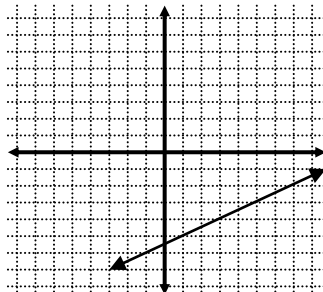
Count \downarrow , Count \rightarrow
OR

Count \uparrow , Count \leftarrow

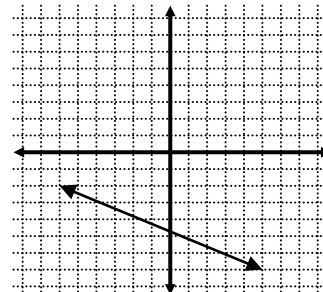
If slope is a whole number
put a 1 underneath to
make it a fraction.

3. A line goes through the point $(1, -5)$ and has a slope $\frac{1}{2}$. Graph this line.

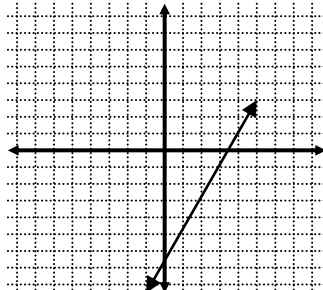
A.



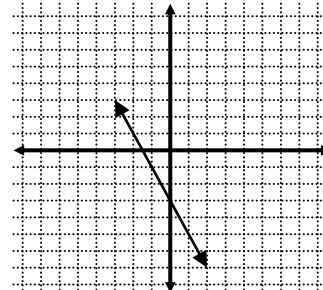
B.



C.

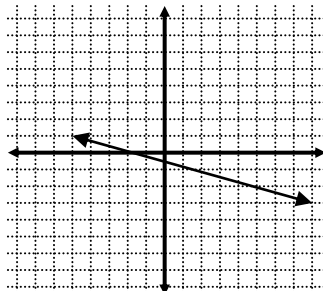


D.

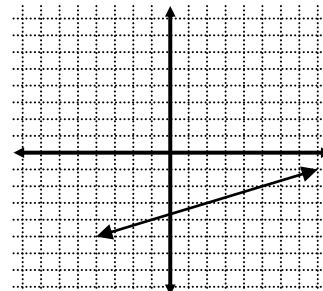


4. A line goes through the point $(5, -2)$ and has slope $\frac{1}{3}$. Graph this line.

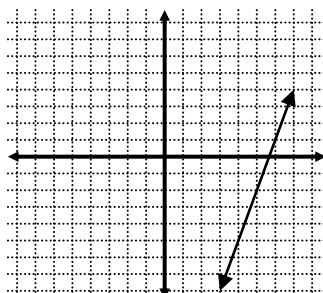
F.



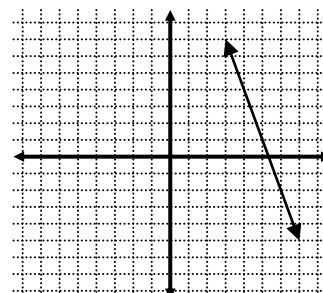
G.



H.



J.



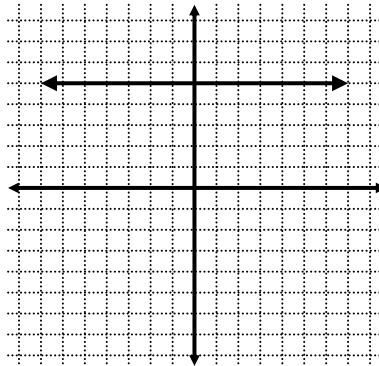
5. Identify the function $f(x) = [x] + 4$.

- A. Greatest Integer
- B. Absolute Value
- C. Direct Variation
- D. Constant

6. Which is an identity function?

- F. $f(x) = 1$
- G. $f(x) = x$
- H. $f(x) = |x|$
- J. $f(x) = [x]$

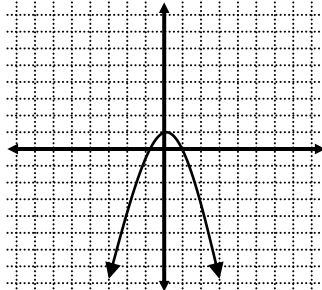
7. Identify the type of function for the graph below.



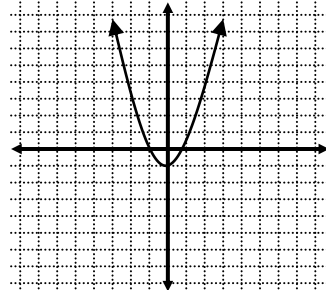
- A. Greatest Integer
- B. Constant
- C. Identity
- D. Absolute Value

8. Graph: $y = x^2 - 1$

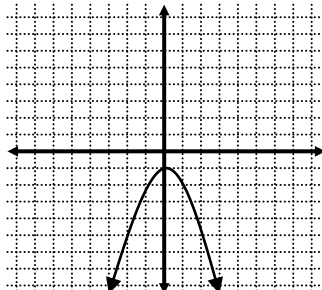
F.



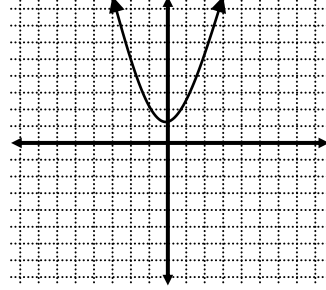
G.



H.

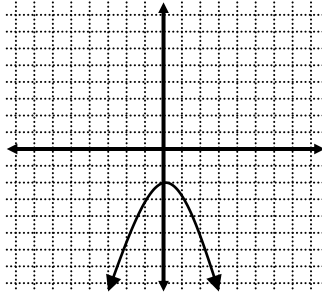


J.

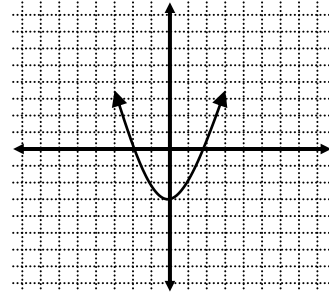


9. Graph: $y = x^2 + 3$

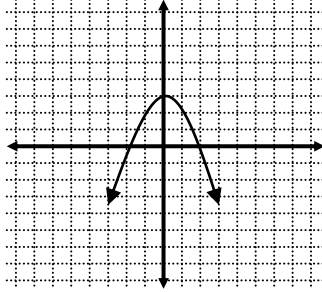
A.



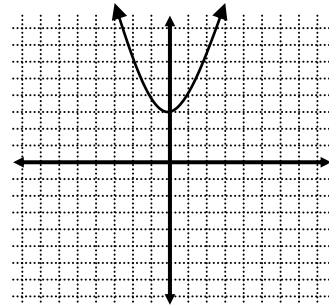
B.



C.

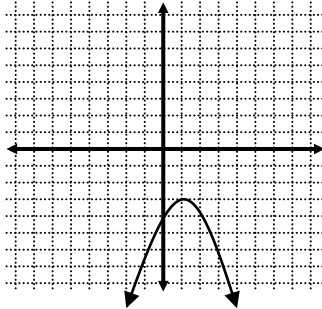


D.

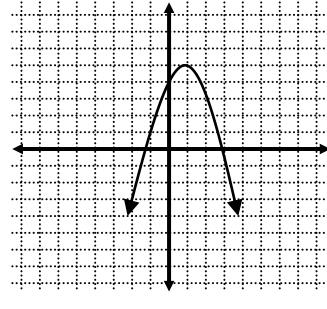


10. Write the following equation in the form $y = a(x-h)^2 + k$ and graph.
 $y = -x^2 + 2x - 4$

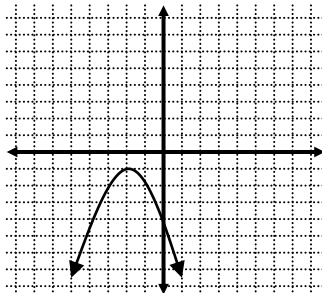
F.



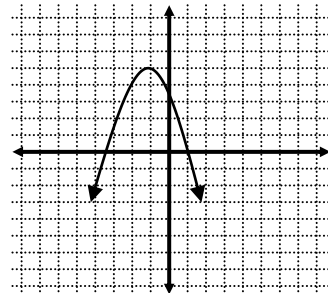
G.



H.



J.



Degree	Name
X	Linear
X ²	Quadratic
X ³	Cubic
X ⁴	Quartic
X ⁵	Quintic

The degree of a polynomial is the highest power of x.

11. Identify the polynomial function $f(x) = 5x^2 + 6x^3 - 9x^4 + x + 3$.

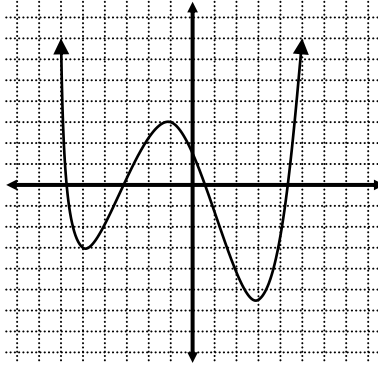
- A. Quartic
- B. Cubic
- C. Quadratic
- D. Quintic

Real zeroes occur where the graph crosses the x-axis.

12. Identify the polynomial function, give the degree and the maximum number of real zeros : $g(x) = -6x^5 + 7x^4 + 4x^2 + 2x - 13.5$.

- F. Quintic, 4, 5
- G. Quartic, 4, 4
- H. Quintic, 5, 5
- J. Not a polynomial function

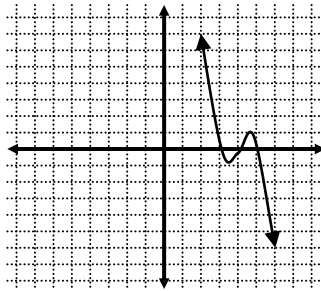
13. Determine whether the degree of the function below is odd or even. How many real zeroes does the function have?



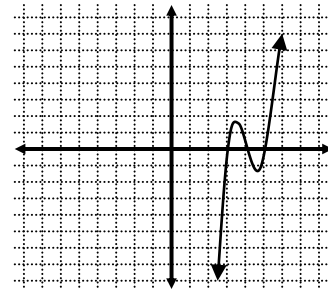
- A. Odd; 4 Zeros
- B. Even; 3 Zeros
- C. Even; 4 Zeros
- D. Odd; 3 Zeros

14. Which the following represents the graph of $f(x) = x^3 - 12x^2 + 47x - 60$?

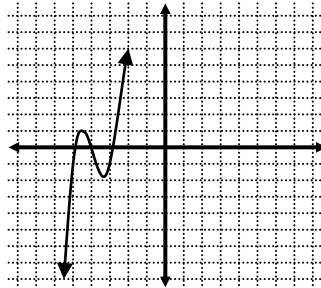
F.



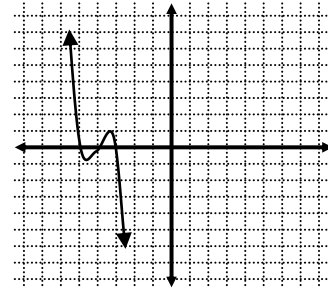
G.



H.



J.



Notes and/or Formula

Composite Function $f(g(x))$
Substitute the entire
expression for $g(x)$ into all
of the x 's in the expression
for $f(x)$

9. If $Q(x) = x^2 + x - 2$, find $Q(-4)$.
- A. -14
B. 18
C. 10
D. -10
10. Find $f(3)$ given $f(x) = 4x^2 + 3x + 13$
- F. 35
G. 22
H. 41
J. 27
11. Find $g(f(x))$ where $f(x) = x - 1$ and $g(x) = \frac{x-8}{5}$.
- A. $\frac{6x-13}{5}$
B. $\frac{x-13}{5}$
C. $\frac{x^2-9x+8}{5}$
D. $\frac{x-9}{5}$
12. If $f(x) = 3x^2 + 5$ and $g(x) = 2x - 6$, find $g(f(x))$.
- F. $2(3x^2 + 5) - 6$
G. $3(2x - 6) + 5$
H. $3x^2 + 2x - 1$
J. $3(2x - 6)^2 + 5$
13. Find $g(f(x))$ where $f(x) = x + 7$ and $g(x) = \frac{x+5}{2}$
- A. $\frac{x+19}{2}$
B. $\frac{3x+19}{2}$
C. $\frac{x^2+12x+35}{2}$
D. $\frac{x+12}{2}$
14. Solve for x by factoring. $x^2 + x - 2 = 0$
- F. 2, 1
G. -2, 1
H. -2, -1
J. -1, 2

Notes and/or Formulas

Rational Zero Theorem

The factors of the leading coefficient will be "Q".

The factors of the constant will be "P".

To find all the possible rational roots for a polynomial, "every P over every Q"

15. Find all the real zeros. $x^2 + 2x - 15 = 0$

- A. 5, 3
- B. -3, 5
- C. -5, -3
- D. -5, 3

16. Find all real zeros of the function. $y = 8x^4 + 8x^3 - 336x^2$

- F. 0, 6, 8
- G. 0, 6
- H. -7, 0, 6
- J. None of these answers

17. Find all real zeros of the function. $y = -3x^4 - 12x^3 + 15x^2$

- A. -5, 0
- B. -5, 0, 1
- C. -5, -3, 0
- D. None of these answers

18. List all the possible rational zeros of the polynomial

$f(x) = -55x^4 + 6x^3 - 2x^2 + 3x - 14$ according to the rational zero theorem.

- F. $\pm 1, \pm 2, \pm 7, \pm 14$
- G. $\pm \frac{2}{5}, \pm \frac{7}{5}, \pm \frac{14}{5}, \pm \frac{1}{11}, \pm \frac{2}{11}, \pm \frac{7}{11}, \pm \frac{14}{55}$
 $\pm 1, \pm 2, \pm 7, \pm 14, \pm \frac{1}{5}, \pm \frac{2}{5}, \pm \frac{7}{5}, \pm \frac{14}{5}, \pm \frac{1}{11},$
- H. $\pm \frac{2}{11}, \pm \frac{7}{11}, \pm \frac{14}{11}, \pm \frac{1}{55}, \pm \frac{2}{55}, \pm \frac{7}{55}, \pm \frac{14}{55}$
- J. $\pm 1, \pm 2, \pm \frac{2}{5}, \pm \frac{7}{5}, \pm \frac{2}{11}, \pm \frac{7}{11}$

19. Given that one zero is 4, which of the following is NOT a zero of P(x).

$P(x) = x^3 - 13x - 12$

- A. -1
- B. 4
- C. -3
- D. -6

20. Given that one zero is $-3 + 2i$, which of the following is NOT a zero of P(x).

$P(x) = x^3 + 7x^2 + 19x + 13$

- F. $-3 - 2i$
- G. $-3 + 2i$
- H. -1
- J. 1

Notes and/or Formulas

To find an inverse

1. Switch x and y
2. Solve for y

21. Which of the following is a zero of the function

$$f(x) = 2x^4 + 7x^3 - 8x^2 - 43x - 30?$$

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

B. $-\frac{5}{2}$

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

D. $-\frac{2}{5}$

22.

function $f(x) = 5x^3 - 9$.

F. $\frac{1}{5x^3 - 9}$

G. $\sqrt[3]{\frac{x+9}{5}}$

H. $\frac{(x+9)^3}{125}$

J. $5x^{-1} - 9$

Find the inverse given the

23.

Given $f(x) = 4x^2 - 1$, find $f^{-1}(x)$.

A. $\frac{1}{4x^2 - 1}$

B. $4x^{-1} - 1$

C. $\frac{(x+1)^2}{64}$

D. $\pm\sqrt{\frac{x+1}{4}}$

	Topic: Relations & Functions All.15
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All.15 The student will recognize the general shape of polynomial, exponential, and logarithmic functions. The graphing calculator will be used as a tool to investigate the shape and behavior of these functions.

Notes and/or Formulas

1. Identify the polynomial function $f(x) = 5x^2 + 6x^3 - 5x + 9$
 - A. Cubic
 - B. Quadratic
 - C. Quartic
 - D. Quintic

2. Identify the polynomial function, give the degree and the maximum number of real zeros. $g(x) = 4x^5 + 7x^4 - 5x^2 + 12$
 - F. Not a polynomial function
 - G. Quintic, 4, 5
 - H. Quartic, 4, 4
 - J. Quintic, 5, 5

3. Use synthetic division to perform the following $(5x^4 + 6x^2 + 7) \div (x + 1)$
 - A. $5x^3 + 11x^2 + \frac{18}{x+1}$
 - B. $5x^3 - 5x^2 + 11x - 11 + \frac{18}{x+1}$
 - C. $5x^3 + 5x^2 + 11x + 11 + \frac{18}{x+1}$
 - D. $5x^3 + x^2 + \frac{6}{x+1}$

Topic: Relations & Functions All.16

All.16 The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve practical problems, including writing the first n terms, finding the n th term and evaluating summation formulas.

Notation will include Σ and a_n .

Notes and/or Formulas

Term Formulas

A: $a_n = a_1 + (n-1)d$

G: $a_n = a_1 \cdot r^{n-1}$

Sum Formulas

A: $S = \frac{n(a_1 + a_n)}{2}$

G: $S = \frac{a_1(1-r^n)}{1-r}$

IG: $S = \frac{a_1}{1-r}$

If you forget the formulas, just list series out and count terms or add terms on calculator.

1. Insert two arithmetic means between -2 and 13.

- A. 1, 10
- B. 3, 8
- C. 2, 9
- D. 4, 7

2. Evaluate: $\sum_{n=1}^{25} (3n + 2)$

- F. 984
- G. 1000
- H. 1025
- J. 2050

3. Which is an arithmetic sequence?

- A. 2, 5, 9, 14...
- B. 100, 50, 12.5, 1.6...
- C. 3, 10, 17, 24...
- D. -8, -4, -2, -1...

4. If $a_n = 3(2)n$ which of the following represents a_3

- F. 12
- G. 18
- H. 24
- J. 27

5. Which of the following represents $\sum_{n=2}^8 (3n - 2)$

- A. 26
- B. 69
- C. 91
- D. 92

6. Find the next term in the sequence 8, 5, 2, -1.

- F. -2
- G. -3
- H. -4
- J. -5

Topic: Relations & Functions AII.20

All.20 The student will identify, create, and solve practical problems involving inverse variation and a combination of direct and inverse variation.

Notes and/or Formulas

Inverse Variation

$$\text{Function } y = \frac{k}{x}$$

$$k = y \cdot x$$

Direct Variation

$$\text{Function } y = kx$$

$$k = \frac{y}{x}$$

1. The area (A) of a circle varies directly as the square of the radius (r). If k is the constant of proportionality, which is the formula for this relationship?
 - A. $A = \frac{k}{r^2}$
 - B. $A = kr$
 - C. $A = kr^2$
 - D. $r = kA^2$
2. The frequency of a radio signal varies inversely as the wave length. A signal of frequency 1200 kilohertz (kHz), which might be the frequency of an AM radio station, has a wave length 250 m. What frequency has a signal wave length of 400m?
 - F. 83 kHz
 - G. 750 kHz
 - H. 1350 kHz
 - J. 1920 kHz

Topic: Analytical Geometry All.10

All.10 The student will investigate and describe through the use of graphs the relationships between the solution of an equation, zero of a function, x-intercept of a graph, and factors of a polynomial expression.

Notes and/or Formulas

Zeros are where the graph crosses the x-axis.

Factored form ($x - \text{zero}$)

Ex: If zero at 2, then factor is $(x - 2)$

If zero at -5, then factor is $(x + 5)$

1. Which of the following functions has x-intercepts at 1 and -2?

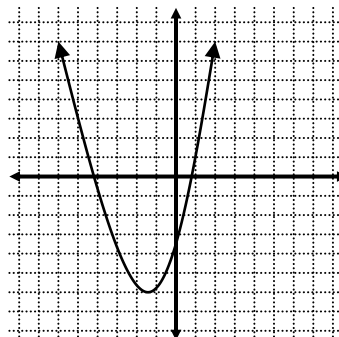
- A. $y = x^2 - x - 2$
- B. $y = x^2 + x - 2$
- C. $y = x^2 - 2x + 1$
- D. $y = 2x - 1$

2. Find all real zeros. $0 = x^2 - 3x - 10$

- F. -2, -5
- G. 2, 5
- H. -2, 5
- J. -5, 2

3. Use the graph to determine the roots of the equation.

- A. 1 and 4
- B. 1 and -4
- C. -3
- D. None of these answers



4. Find all the real zeros of the function. $y = 7x^4 - 56x^3 + 84x^2$

- F. 0, 2, 6
- G. 0, 2
- H. 0, 2, 7
- J. None of these answers

5. Find all the real zeros of the function. $2x^2 - x - 3 = 0$

- A. $\frac{3}{2}, -1$
- B. $-\frac{3}{2}, 1$
- C. 3, -2
- D. 6, -4

6. Find all the real zeros of the function. $3x^2 + 4x - 15 = 0$

F. $5, -3$

G. $-\frac{5}{3}, 3$

H. $\frac{5}{3}, -3$

J. $10, -18$

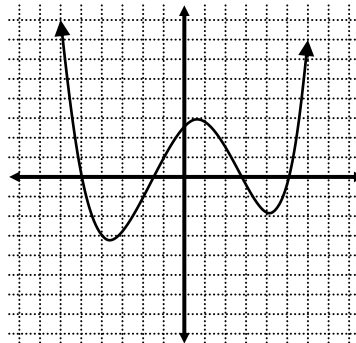
7. Which of the following could *not* be a factor of the function?

A. $(x+5)$

B. $(x-5)$

C. $(x-3)$

D. $(x+3)$



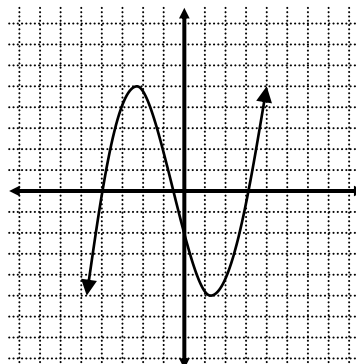
8. What are the factors of the given graph?

F. $(2x-1)(x-3)(x+4)$

G. $(2x-1)(x-4)(x+3)$

H. $(2x-1)(x+4)(x+3)$

J. $(2x+1)(x+4)(x-3)$



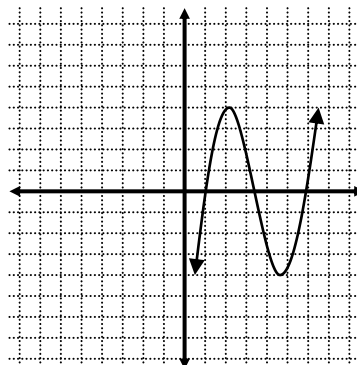
9. What type of polynomial function is illustrated in the graph?

A. Linear

B. Quadratic

C. Cubic

D. Quartic



Topic: Systems of Equations & Inequalities All.13

All.13 The student will solve practical problems using systems of linear inequalities and linear programming, and describe the results both orally and in writing. A graphing calculator may be used to facilitate solutions.

Notes and/or Formulas

$y > mx + b$
dotted line, shade above

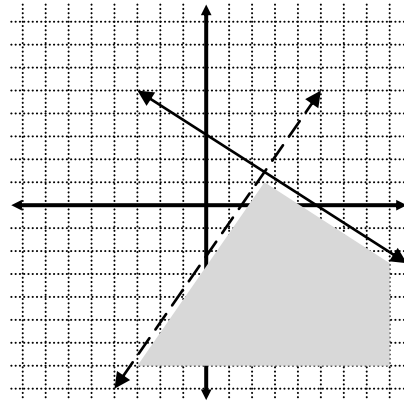
$y < mx + b$
dotted line, shade below

$y \geq mx + b$
solid line, shade above

$y \leq mx + b$
solid line, shade below

1. Choose the system of linear inequalities shown by the graph.

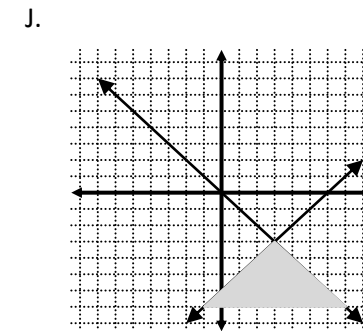
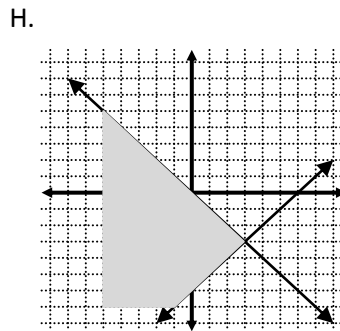
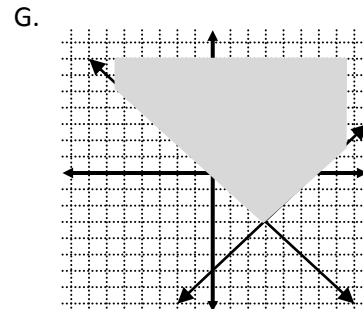
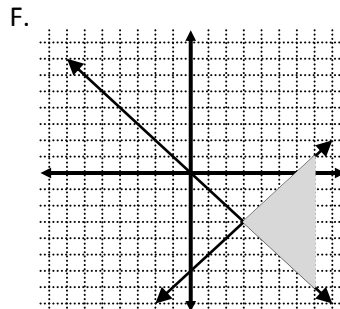
- A.
 $y < \frac{3}{2}x - 2$
 $y \leq -\frac{2}{3}x + 3$
- B.
 $y > \frac{3}{2}x - 2$
 $y \geq -\frac{2}{3}x + 3$
- C.
 $y > \frac{3}{2}x - 2$
 $y \leq -\frac{2}{3}x + 3$
- D.
 $y < \frac{3}{2}x - 2$
 $y \geq -\frac{2}{3}x + 3$



2. Graph the system of inequalities:

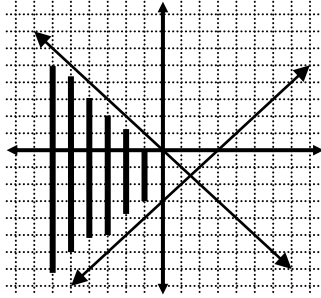
$$y \leq x - 6$$

$$x + y \leq 0$$

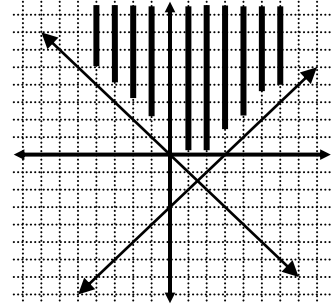


3. Graph the system of inequalities:
- $$y \leq x - 3$$
- $$x + y \geq 0$$

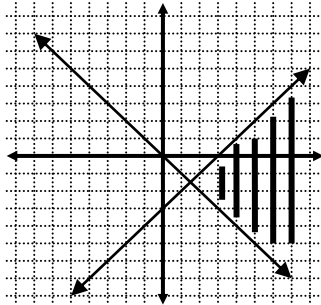
A.



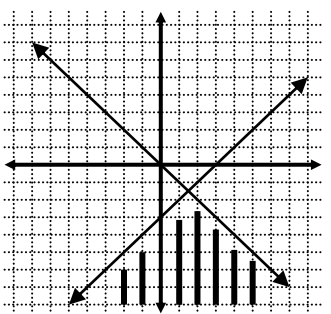
B.



C.



D.



4. Find the maximum and minimum values of the function subject to the given constraints.

$$x + y \geq 2$$

$$6x - 6y \leq 12$$

$$8y \leq 4x + 16$$

$$f(x, y) = 3x + 7y$$

- F. The maximum value of f is 76 at (9, 7).
The minimum value of f is 9 at (3, 0).
- G. The maximum value of f is 56 at (7, 5).
The minimum value of f is 3 at (1, 0).
- H. The maximum value of f is 72 at (10, 6).
The minimum value of f is 0 at (0, 0).
- J. The maximum value of f is 66 at (8, 6).
The minimum value of f is 6 at (2, 0).
5. Eleanor raises only free-range chickens and turkeys. She wants to raise no more than 60 animals with no more than 20 turkeys. She spends \$1 to raise a chicken and \$4 to raise a turkey. She has at most \$105 to spend on the animals. Find the maximum profit Eleanor can make if she makes a profit of \$3 per chicken and \$8 per turkey. How many chickens should she raise?
- A. 45
B. 25
C. 35
D. 15

Topic: Systems of Equations & Inequalities All.14

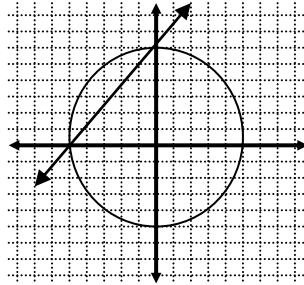
All.14 The student will solve nonlinear systems of equations, including linear-quadratic and quadratic-quadratic, algebraically and graphically.

Notes and/or Formulas

Number of solutions
 Number of points of
 intersection on graph

1. How many solutions are there for this system?

- A. 0
- B. 1
- C. 2
- D. 3



2. Solve:

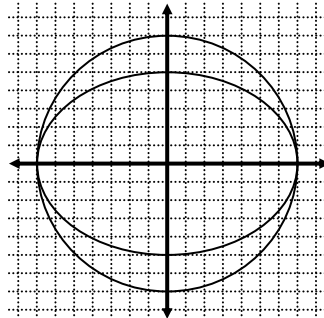
$$x^2 + y^2 = 41$$

$$y = 3x - 7$$

- F. (-4, -4)
- G. (4, 5)
- H. (5, 8)
- J. (-4, -19)

3. Which is the solution to the system below?

- A. $\{(0, -7), (0, 7)\}$
- B. \emptyset
- C. $\{(-7, 0), (7, 0)\}$
- D. $\{(0, -5), (0, 5)\}$



$$x^2 + y^2 = 49$$

4. Solve the system graphically:


$$\frac{x^2}{64} + \frac{y^2}{81} = 1$$


- F. $\{(0, -8), (0, 8)\}$
- G. $\{(0, -9), (0, 9)\}$
- H. \emptyset
- J. $\{(-8, 0), (8, 0)\}$

Topic: Statistics All.19

All.19 The student will collect and analyze data to make prediction and solve practical problems. Graphing calculators will be used to investigate scatter plots and to determine the equation for the curve of best fit.

Notes and/or Formulas

 Negative slope & correlation

 Positive slope & correlation

Line of best fit:

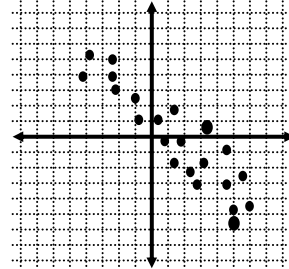
Look for slope & y-int.

Calculator:

1. Put data into lists
Stat-edit-L₁-L₂
2. Stat-calc-4:Lin Reg-enter
3. Equation for line of best fit is $y = ax + b$ and substitute the values given for a and b

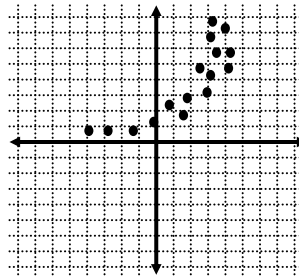
1. Determine the correlation for the scatter plot.

- A. Strong positive correlation.
- B. Strong negative correlation.
- C. No correlation
- D. Not enough information given.



2. Look at the given scatter plot. This data best fits what type of equation?

- F. Linear
- G. Exponential
- H. Logarithmic
- J. Quadratic



3. Which of the following equations represents the line of best fit for the following data?

X	23	26	26	33	34	44	44	45	64
Y	25	25	26	21	18	19	21	19	15

- A. $y = 4.8x + 32$
- B. $y = -0.125x - 32.4$
- C. $y = -0.324x + 32.4$
- D. $y = -3.24x - 32$

4. The table shows the number of students enrolled in the Honors Algebra-Trig program at Menchville High School the first 5 years since its initiation. What is your prediction for the number of students in the *eighth* year?

- F. 120
- G. 130
- H. 140
- J. 150

Year (X)	Number of Students (Y)
1	55
2	71
3	84
4	97
5	108