Preparing for Algebra 2 - Summer Review Packet – 2022

DUE **AUGUST 31, 2022** in the appropriate Google Classroom

About Algebra 2:
Algebra 2 begins with a review of Algebra 1. It teaches students to think, reason and communicate mathematically. Students use variables to determine solutions to real world problems. Students use a graphing calculator as an integral tool in analyzing data and modeling functions to represent real world applications.

A ***TI-84 Plus CE*** graphing calculator is recommended for this course. Most teachers at Saint Dominic Academy use the TI-84. Students who purchase a difference model (e.g. TI-Nspire, Casio, etc) will be responsible for learning their operation.

Expectations of the Summer Packet:
The problems in this packet are designed to help you review topics that are important to your success in Pre-Calculus. ***All work must be neatly shown for each problem***. The problems should be done correctly, not just attempted.

All work should be completed and ready to turn in on Google Classroom.

There may be a QUIZ on this material at the beginning of school.

Some helpful sites:

www.purplemath.com/modules/index.html
www.coolmath.com
www.khanacademy.com
www.studentguide.org/a-complete-list-of-online-math-online-resources/
www.profrobbob.com (Tarrou's Chalk Talk)

Enjoy your summer!

WELCOME TO ALGEBRA 2

Contents

Section 1. Simplifying Polynomial Expressions

Combining Like Terms

You can add or subtract terms that are considered "like", or terms that have the same variable(s) with the same exponent(s).

Example 1: $5x - 7y + 10x + 3y$ $5x - 7y + 10x + 3y$ $15x - 4y$	***Example* 2:** $-8h^2 + 10h^3 - 12h^2 - 15h^3$ $-8h^2 + 10h^3 - 12h^2 - 15h^3$ $-20h^2 - 5h^3$

Applying the Distributive Property

Every term inside the parentheses is multiplied by the term outside of the parentheses.

Example 1. $3\ (9x – 4)$ $3\ (9x) – 3\ (4)$ $27x – 12$	**Example 2** $4x^2\ (5x^3 + 6x)$ $4x^2\ (5x^3) + (4x^2)(6x)$ $20x^5 + 24x^3$

Combining Like Terms AND the Distributive Property (Problems with a Mix!)

Sometimes problems will require you to distribute AND combine like terms!!

Example 1. $3\ (4x – 2) + 13x$ $3\ (4x) – 3\ (2) + 13x$ $12x – 6 + 13x$ $25x – 6$	**Example 2.** $3\ (12x – 5) – 9\ (– 7 + 10x)$ $3\ (12x) – 3(5) – 9\ (– 7) – 9(10x)$ $36x – 15 + 63 – 90x$ $– 54x + 48$

Simplify

1. $8x – 9y + 16\ x + 12y$	**2. $14\ y + 22 – 15y^2 + 23y$**

3. 5n – (3 – 4n)	**4. – 2 (11 b – 3)**
5. 10q (16x + 11)	**6. – (5x – 6)**
7. 3 (18z – 4w) + 2 (10z – 6w)	**8. (8c + 3) + 12 (4c – 10)**
9. 9 (6x – 2) – 3 (9x^2 – 3)	**10. – (y – x) + 6 (5x + 7)**

Section 2. Solving Equations

Solve Equations Using Addition, Subtraction, Multiplication or Division

If the same number is added to each side of an equation, the resulting equation is equivalent to the original one. In general if the original equation involves subtraction, this property will help you solve the equation.

Similarly, if the same number is subtracted from each side of an equation, the resulting equation is equivalent to the original one.

If each side of an equation is multiplied or divided by the same nonzero number, the resulting equation is equivalent to the given one.

Addition Property of Equality	For any numbers a, b, and c, if $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	For any numbers a, b, and c, if $a = b$, then $a - c = b - c$.
Multiplication Property of Equality	For any numbers a, b, and c, if $a = b$, then $ac = bc$.
Division Property of Equality	For any numbers a, b, and c, with $c \neq 0$, if $a = b$, then $\frac{a}{b} = \frac{b}{c}$.

Variables on Each Side To solve an equation with the same variable on each side, first use the Addition or the Subtraction Property of Equality to write an equivalent equation that has the variable on just one side of the equation. Then solve the equation.

Grouping Symbols When solving equations that contain grouping symbols, first use the Distributive Property to eliminate grouping symbols. Then solve.

Example 1: Solve $5y - 8 = 3y + 12$.

$5y - 8 = 3y + 12$

$5y - 8 - 3y = 3y + 12 - 3y$

$2y - 8 = 12$

$2y - 8 + 8 = 12 + 8$

$2y = 20$

$\frac{2y}{2} = \frac{20}{2}$

$y = 10$

The solution is 10.

Example 2: Solve $4(2a - 1) = -10(a - 5)$.

$4(2a - 1) = -10(a - 5)$ Original equation

$8a - 4 = -10a + 50$ Distributive Property

$8a - 4 + 10a = -10a + 50 + 10a$ Add $10a$ to each side.

$18a - 4 = 50$ Simplify.

$18a - 4 + 4 = 50 + 4$ Add 4 to each side.

$18a = 54$ Simplify.

$\frac{18a}{18} = \frac{54}{18}$ Divide each side by 18.

$a = 3$ Simplify.

The solution is 3.

Solve each equation. You must show all work.

11. $5x - 2 = 33$

12. $140 = 4x + 36$

13. $8(3x - 4) = 196$

14. $45x - 720 + 15x = 60$

15. $132 = 4\,(12x - 9)$

16. $198 = 154 + 7x - 68$

17. $-131 = -5\,(3x - 8) + 6x$

18. $-7x - 10 = 18 + 3x$

19. $12x + 8 - 15 = -2(3x - 82)$

20. $-(12x - 6) = 12x + 6$

Section 3. Solving Literal Equations

Solve for Variables

Sometimes you may want to solve an equation such as $V = \ell wh$ for one of its variables. For example, if you know the values of V, w, and h, then the equation $\ell = \frac{V}{wh}$ is more useful for finding the value of ℓ. If an equation that contains more than one variable is to be solved for a specific variable, use the properties of equality to isolate the specified variable on one side of the equation.

Example 1: Solve $2x - 4y = 8$, for y.	**Example 2: Solve $3m - n = km - 8$, for m.**
$2x - 4y = 8$ $2x - 4y - 2x = 8 - 2x$ $-4y = 8 - 2x$ $\frac{-4y}{-4} = \frac{8-2x}{-4}$ $y = \frac{8-2x}{-4}$ or $\frac{2x-8}{4}$ The value of y is $\frac{2x-8}{4}$.	$3m - n = km - 8$ $3m - n - km = km - 8 - km$ $3m - n - km = -8$ $3m - n - km + n = -8 + n$ $3m - km = -8 + n$ $m(3 - k) = -8 + n$ $\frac{m(3-k)}{3-k} = \frac{-8+n}{3-k}$ $m = \frac{-8+n}{3-k}$ or $\frac{n-8}{3-k}$ The value of m is $\frac{n-8}{3-k}$ Since division by 0 is undefined, $3 - k \neq 0$, or $k \neq 3$.

Solve each equation for the specified variable

21. $Y + V = W$, solve for V	22. $9wr = 81$, solve for w	23. $2d - 3f = 9$, solve for f
24. $dx + t = 10$, solve for x	*25. Solve for g* $P = (g - 9)180$	26. Solve for x $4x + y - 5h = 10y + u$

Section 4. Rules of Exponents

Name of Rule	Algebraic Rule	Rule In Words	Examples
Product Rule	$a^m \cdot a^n = a^{m+n}$	When multiplying with exponential notation, if the bases are the same, keep the base and add the exponents.	$5^6 \cdot 5^3 = 5^{6+3} = 5^9$ $4^5 \cdot 4^{-2} = 4^{5+(-2)} = 4^3$
Quotient Rule	$\frac{a^m}{a^n} = a^{m-n}$	When dividing with exponential notation, if the bases are the same, keep the base and subtract the exponent of the denominator from the exponent of the numerator.	$\frac{m^5}{m^{-4}} = m^{5-(-4)} = m^{5+4} = m^9$
Power Rule	$(a^m)^n = a^{mn}$	To raise a power to a power, multiply the exponents.	$(y^{-3})^{-7} = y^{(-3)(-7)} = y^{21}$
Raising a Product to a Power	$(ab)^n = a^n b^n$	To raise a product to the nth power, raise each factor to the nth power.	$(3x^3y^4)^2$ means $(3^1x^3y^4)^2$ $=3^2(x^3)^2(y^4)^2$ $= 9x^6y^8$
Raising a Quotient to a Power	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	To raise a quotient to the nth power, raise both the numerator and the denominator to the nth power.	$\left(\frac{-3}{b^5}\right)^3 = \frac{(-3)^3}{(b^5)^3} = \frac{-27}{b^{15}}$
Exponent of 1	$a^1 = a$	Any number raised to the first power yields the original number.	$x^1 = x, \quad 7^1 = 7$
Exponent of 0 (zero)	$a^0 = 1, \quad a \neq 0$	Any non-zero number raised to the zero power yields 1. 0^0 is undefined.	$(5x)^0 = 1, \quad 397^0 = 1$
Negative Integers as Exponents	$a^{-n} = \frac{1}{a^n}$	Any number raised to a negative exponent is the same as the reciprocal of that number raised to the opposite exponent.	$5x^{-3} = \frac{5}{x^3} \qquad \frac{1}{n^{-7}} = n^7$

Simplify Each Expression

27. $(c^5)(c)(c^2)$	28. $\frac{m^{15}}{m^3}$	29. $(k^4)^5$
30. d^0	31. $(p^4q^2)(p^7q^5)$	32. $\frac{45y^3z^{10}}{5y^3z}$
33. $(-t^7)^3$	34. $3f^3g^0$	35. $(4h^5k^3)(15k^2h^3)$
36. $\frac{12a^4b^6}{36ab^2c}$	37. $(3m^2n)^4$	38. $(12x^2y)^0$
39. $(-5a^2b)(2ab^2c)(-3b)$	40. $4x(2x^2y)^0$	41. $(3x^4y)(2y^2)^3$

Section 5. Binomial Multiplication

To multiply two binomials, you can apply the Distributive Property twice. A useful way to keep track of terms in the product is to use the **F-O-I-L** method as illustrated in **Example 2**.

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Example 1: Find $(x + 3)(x - 4)$.

Horizontal Method

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

$= x(x - 4) + 3(x - 4)$

$= (x)(x) + x(-4) + 3(x) + 3(-4)$

$= x^2 - 4x + 3x - 12$

$= x^2 - x - 12$

Vertical Method

$$\begin{array}{rr} & x + 3 \\ (\times) & x - 4 \\ \hline & -4x - 12 \\ x^2 + 3x & \\ \hline x^2 - & x - 12 \end{array}$$

The product is $x^2 - x - 12$.

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Example 2:

Find $(x - 2)(x + 5)$ using the F-O-I-L method.

$(x - 2)(x + 5)$

First Outer Inner Last

$= (x)(x) + (x)(5) + (-2)(x) + (-2)(5)$

$= x^2 + 5x + (-2x) - 10$

$= x^2 + 3x - 10$

The product is $x^2 + 3x - 10$.

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Multiply each pair of binomials. Write your answer in simplest form.

42. $(x + 10)(x - 9)$	43. $(x + 7)(x - 12)$
44. $(x - 10)(x - 2)$	45. $(x - 8)(x + 81)$
46. $(2x - 1)(4x + 3)$	47. $(-2x + 10)(-9x + 5)$
48. $(-3x - 4)(2x + 4)$	49. $(x + 10)^2$
50. $(-x + 5)^2$	51. $(2x - 3)^2$

Section 6. Factoring

First determine if there is a Greatest Common Factor (GCF).

Example: Factor $3x^4 - 33x^3 + 90x^2 = 3x^2(x^2 - 11x + 30)$

To factor a trinomial of the form $x^2 + bx + c$, find two integers, *m* and *p*, whose sum is equal to *b* and whose product is equal to *c*.

Factoring $x^2 + bx + c$	$x^2 + bx + c = (x + m)(x + p)$, where $m + p = b$ and $mp = c$

Example 1: Factor each polynomial.

a. $x^2 + 7x + 10$

In this trinomial, $b = 7$ and $c = 10$.

Factors of 10	Sum of Factors
1, 10	11
2, 5	7

Since $2 + 5 = 7$ and $2 \cdot 5 = 10$, let $m = 2$ and $p = 5$.

$x^2 + 7x + 10 = (x + 5)(x + 2)$

b. $x^2 - 8x + 7$

In this trinomial, $b = -8$ and $c = 7$. Notice that $m + p$ is negative and mp is positive, so m and p are both negative.

Since $-7 + (-1) = -8$ and $(-7)(-1) = 7$, $m = -7$ and $p = -1$.

$x^2 - 8x + 7 = (x - 7)(x - 1)$

Example 2: Factor $x^2 + 6x - 16$.

In this trinomial, $b = 6$ and $c = -16$. This means $m + p$ is positive and mp is negative.

Make a list of the factors of –16, where one factor of each pair is positive.

Factors of –16	Sum of Factors
1, –16	–15
–1, 16	15
2, –8	–6
–2, 8	6

Therefore, $m = -2$ and $p = 8$.

$x^2 + 6x - 16 = (x - 2)(x + 8)$

Factor each expression. (Remember: it may be easier pull out any Greatest Common Factor)

52. $3x^2 + 6x$	**53.** $4a^2b^2 - 16ab^3 + 8ab^2c$

54. $n^2 + 8n + 15$	**55.** $g^2 - 9g + 20$
56. $d^2 + 3d - 28$	**57.** $z^2 - 7z - 30$
58. $m^2 + 18m + 81$	**59.** $5k^2 + 30k - 135$

Factor $ax^2 + bx + c$

To factor a trinomial of the form $ax^2 + bx + c$, find two integers *m* and *p* whose product is equal to *ac* and whose sum is equal to *b*. If there are no integers that satisfy these requirements, the polynomial is called a **prime polynomial**.

Factoring $ax^2 + bx + c$	$ax^2 + bx + c = (x + m)(x + p)$, where $m + p = b$ and $mp = ac$

Example 1: Factor $2x^2 + 15x + 18$.

In this example, $a = 2$, $b = 15$, and $c = 18$. You need to find two numbers that have a sum of 15 and a product of $2 \cdot 18$ or 36. Make a list of the factors of 36 and look for the pair of factors with a sum of 15.

Factors of 36	Sum of Factors
1, 36	37
2, 18	20
3, 12	15

Use the pattern $ax^2 + mx + px + c$, with $a = 2$, $m = 3$, $p = 12$, and $c = 18$.

$$2x^2 + 15x + 18 = 2x^2 + 3x + 12x + 18$$
$$= (2x^2 + 3x) + (12x + 18)$$
$$= x(2x + 3) + 6(2x + 3)$$
$$= (x + 6)(2x + 3)$$

Therefore, $2x^2 + 15x + 18 = (x + 6)(2x + 3)$.

Example 2: Factor $3x^2 – 3x – 18$.

Note that the GCF of the terms $3x^2$, $3x$, and 18 is 3. First factor out this GCF. $3x^2 – 3x – 18 = 3(x^2 – x – 6)$. Now factor $x^2 – x – 6$. Since $a = 1$, find the two factors of –6 with a sum of –1.

Factors of –6	Sum of Factors
1, –6	–5
–1, 6	5
–2, 3	1
2, –3	–1

Now use the pattern $(x + m)(x + p)$ with $m = 2$ and $p = –3$.

$$x^2 – x – 6 = (x + 2)(x – 3)$$

The complete factorization is
$3x^2 – 3x – 18 = 3(x + 2)(x – 3)$.

Factor each expression.

60. $5x^2 + 13x + 6$	**61.** $4x^2 – 13x + 10$

Factor Differences of Squares

The binomial expression $a^2 - b^2$ is called the **difference of two squares**. The following pattern shows how to factor the difference of squares.

Difference of Squares	$a^2 - b^2 = (a - b)(a + b) = (a + b)(a - b)$.

Example 1 : Factor each polynomial.	**Example 2 : Factor each polynomial.**
a. $n^2 - 64$ $n^2 - 64$ $= n^2 - 8^2$ Write in the form $a^2 - b^2$. $= (n + 8)(n - 8)$ Factor. **b. $4m^2 - 81n^2$.** $4m^2 - 81n^2$ $= (2m)^2 - (9n)^2$ Write in the form $a^2 - b^2$. $= (2m - 9n)(2m + 9n)$ Factor.	**a. $50a^2 - 72$** $50a^2 - 72$ $= 2(25a^2 - 36)$ Find the GCF. $= 2[(5a)^2 - 6^2)]$ $25a^2 = 5a \cdot 5a$ and $36 = 6 \cdot 6$ $= 2(5a + 6)(5a - 6)$ Factor the difference of squares. **b. $4x^4 + 8x^3 - 4x^2 - 8x$** $4x^4 + 8x^3 - 4x^2 - 8x$ Original polynomial $= 4x(x^3 + 2x^2 - x - 2)$ Find the GCF. $= 4x[(x^3 + 2x^2) - (x + 2)]$ Group terms. $= 4x[x^2 (x + 2) - 1(x + 2)]$ Find the GCF. $= 4x[(x^2 - 1)(x + 2)]$ Factor by grouping. $= 4x(x - 1)(x + 1)(x + 2)$ Factor the difference of squares.

Factor each expression. (Remember: it may be easier pull out any Greatest Common Factor)

62. $x^2 - 25$	**63. $4y^3 - 36y$**

Section 7. Simplifying Radicals and Rationalizing Denominators

Product Property of Square Roots The **Product Property of Square Roots** and prime factorization can be used to simplify expressions involving irrational square roots. When you simplify radical expressions with variables, use absolute value to ensure nonnegative results.

Product Property of Square Roots	For any numbers *a* and *b*, where *a* ≥ 0 and *b* ≥ 0, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.

Example 1: Simplify $\sqrt{180}$. $\sqrt{180} = \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5}$ Prime factorization of 180 $= \sqrt{2^2} \cdot \sqrt{3^2} \cdot \sqrt{5}$ Product Property of Square Roots $= 2 \cdot 3 \cdot \sqrt{5}$ Simplify. $= 6\sqrt{5}$ Simplify. or you can find the largest perfect square that divides the radicand evenly. $\sqrt{180} = \sqrt{36}\sqrt{5}$ $= 6\sqrt{5}$	**Example 2: Simplify $\sqrt{120a^2 \cdot b^5 \cdot c^4}$.** $\sqrt{120a^2 \cdot b^5 \cdot c^4}$ $= \sqrt{2^3 \cdot 3 \cdot 5 \cdot a^2 \cdot b^5 \cdot c^4}$ $= \sqrt{2^2} \cdot \sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot \sqrt{a^2} \cdot \sqrt{b^4 \cdot b} \cdot \sqrt{c^4}$ $= 2 \cdot \sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5} \cdot \|a\| \cdot b^2 \cdot \sqrt{b} \cdot c^2$ $= 2\|a\|b^2c^2\sqrt{30b}$

Simplify each radical.

64. $\sqrt{121}$

65. $\sqrt{90}$

66. $\sqrt{175}$

67. $\sqrt{486}$

68. $2\sqrt{16}$

69. $6\sqrt{500}$

70. $3\sqrt{147}$

71. $8\sqrt{475}$

72. $\frac{\sqrt{125}}{\sqrt{9}}$

Rationalizing the Denominator

A fraction containing radicals is in simplest form if no radicals are left in the denominator. The **Quotient Property of Square Roots** and **rationalizing the denominator** can be used to simplify radical expressions that involve division.

When you **rationalize the denominator**, you multiply the numerator and denominator by a radical expression that gives a rational number in the denominator.

Quotient Property of Square Roots	For any numbers *a* and *b*, where $a \geq 0$ and $b > 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$.

Example: Simplify $\sqrt{\frac{56}{45}}$.

$\sqrt{\frac{56}{45}} = \sqrt{\frac{4 \cdot 14}{9 \cdot 5}}$ Factor 56 and 45.

$= \frac{2 \cdot \sqrt{14}}{3 \cdot \sqrt{5}}$ Simplify the numerator and denominator.

$= \frac{2\sqrt{14}}{3\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$ **Multiply by $\frac{\sqrt{5}}{\sqrt{5}}$ to rationalize the denominator.**

$= \frac{2\sqrt{70}}{15}$ Product Property of Square Roots

Rationalize the denominator and write the answer in simplest radical form.

73. $\frac{1}{\sqrt{2}}$	**74.** $\frac{6}{\sqrt{3}}$	**75.** $\frac{5}{\sqrt{25}}$
76. $\frac{8}{2\sqrt{2}}$	**77.** $\frac{1}{\sqrt{29}}$	**78.** $\frac{5}{\sqrt{200}}$

Section 8. Graphing Lines using Slope-Intercept form

Example: Find the slope the line that passes through (1, 2) and (3, –2).

Find the slope *m*.

$\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$	**Slope formula**
$m = \frac{-2 - 2}{3 - 1}$	$y_2 = -2$, $y_1 = 2$, $x_2 = 3$, $x_1 = 1$
$m = -2$	Simplify.

Find the slopes between the set of points using $\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$

79. (-1, 4) and (1, -2)	80. (3, 5) and (-3, 1)	81. (1, -3) and (-1, -2)
82. (2, -4) and (6, -4)	83. (2, 1) and (-2, -3)	84. (5, -2) and (5, 7)

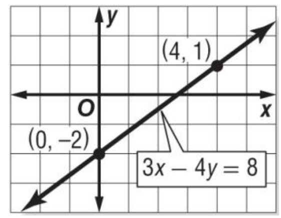
Slope-Intercept Form

Slope-Intercept Form	$y = mx + b$, where m is the slope and b is the y-intercept

Example 1: Write an equation in slope-intercept form for the line with a slope of –4 and a *y*-intercept of 3.

$y = mx + b$ Slope-intercept form
$y = -4x + 3$ Replace m with –4 and b with 3.

Example 2: Graph $3x - 4y = 8$.



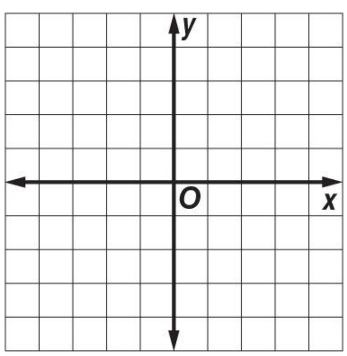
$3x - 4y = 8$ Original equation
$-4y = -3x + 8$ Subtract $3x$ from each side.
$\frac{-4y}{-4} = \frac{-3x + 8}{-4}$ Divide each side by –4.
$y = \frac{3}{4}x - 2$ Simplify.

The y-intercept of $y = \frac{3}{4}x - 2$ is –2 and the slope is $\frac{3}{4}$. So graph the point (0, –2). From this point, move up 3 units and right 4 units. Draw a line passing through both points.

Graph each equation.

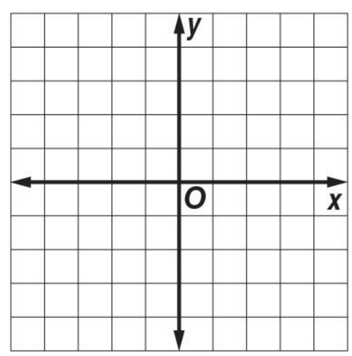
85. $y = 2x + 5$

slope: ______ y-intercept: _______



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

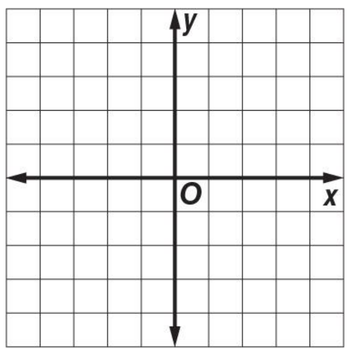
slope: ______ y-intercept: _______



87. $y = -\frac{2}{5}x + 4$

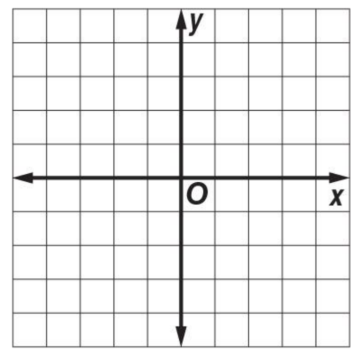
slope: ______ y-intercept: ________

____



88. $y = -3x$

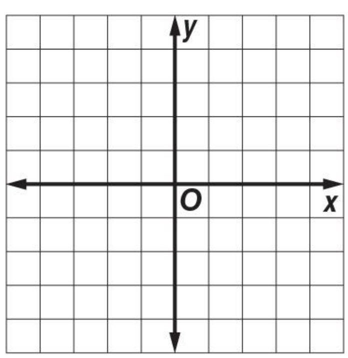
slope: ______ y-intercept:



89. $y = -x + 2$

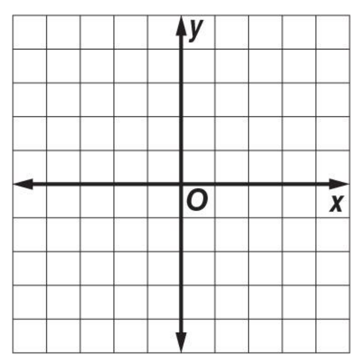
slope: ______ y-intercept: ________

____



90. $y = x$

slope: ______ y-intercept:



Section 9. Graphing Lines using Standard Form

Standard Form of a Linear Equation	$Ax + By = C$, where $A \geq 0$, A and B are not both zero, and A, B, and C are integers with a greatest common factor of 1

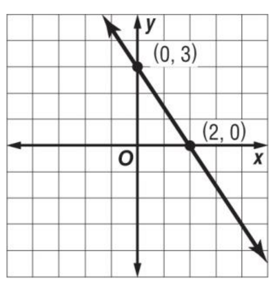
The graph of a linear equations represents all the solutions of the equation. An *x*-coordinate of the point at which a graph of an equation crosses the *x*-axis in an ***x*-intercept.** A *y*-coordinate of the point at which a graph crosses the *y*-axis is called a ***y*-intercept.**

Example 1: Graph $3x + 2y = 6$ by using the *x*- and *y*-intercepts.

To find the *x*-intercept, let $y = 0$ and solve for *x*. The *x*- intercept is 2. The graph intersects the *x*-axis at (2, 0).

To find the *y*-intercept, let $x = 0$ and solve for *y*.
The *y*-intercept is 3. The graph intersects the *y*-axis at (0, 3).

Plot the points (2, 0) and (0, 3) and draw the line through them.



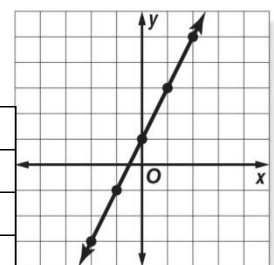
Example 2: Graph $y - 2x = 1$ by making a table.

Solve the equation for *y*.

$y - 2x = 1$	Original equation
$y - 2x + 2x = 1 + 2x$	Add $2x$ to each side.
$y = 2x + 1$	Simplify.

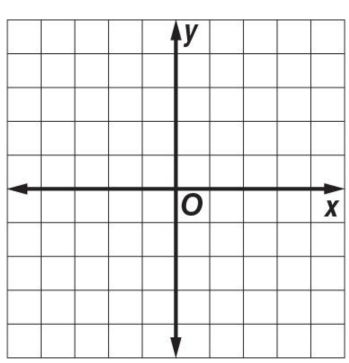
Select five values for the domain and make a table. Then graph the ordered pairs and draw a line through
the points.

x	2*x* + 1	*y*	(*x*, *y*)
–2	2(–2) + 1	–3	(–2, –3)
–1	2(–1) + 1	–1	(–1, –1)
0	2(0) + 1	1	(0, 1)
1	2(1) + 1	3	(1, 3)
2	2(2) + 1	5	(2, 5)

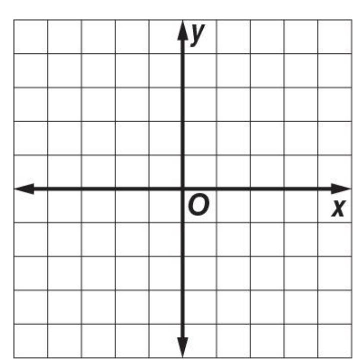


Graph each equation.

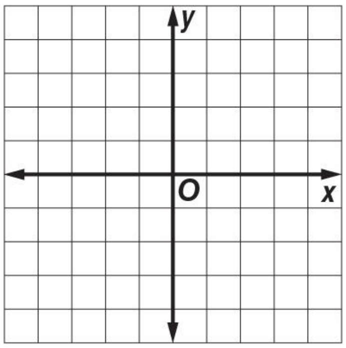
91. 3x + y = 3



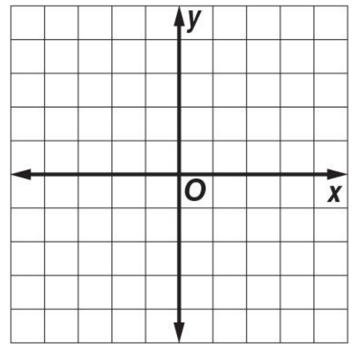
92. 5x + 2y = 10



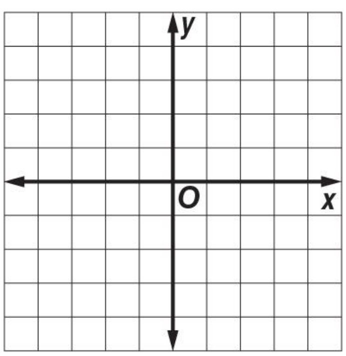
93. y = 4



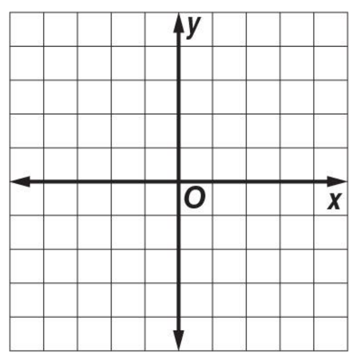
94. $4x - 3y = 9$



95. $-2x + 6y = 12$

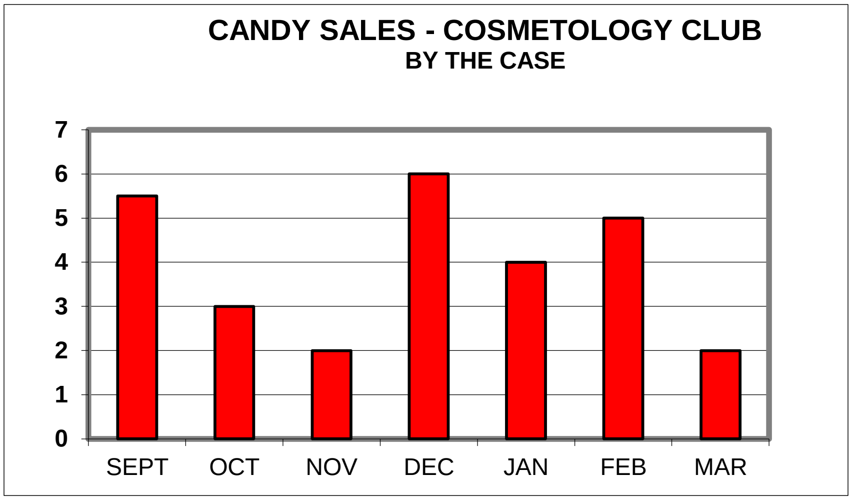


96. $x = -3$



Section 11. Interpreting Graphs

Study the bar graph below and answer the following questions.



97. What does the scale on the left beginning with 0 and ending with 7 represent? A. Number of students selling candy B. Number of cases of candy sold C. Number of candy in each case D. Number of days each month that candy was sold	98. Which two MONTHS had approximately the same amount of candy sold? A. September & February B. October & March C. November & March D. September & December
99. The amount of candy sold in December is twice the amount of candy sold in which other month? A. October B. March C. January D. September	100. What was the total amount of candy sold during the school year shown in the graph? A. 27.5 Cases B. 43 Cases C. 35.5 Cases D. 23 Cases
101. Which month showed a 100% increase in sales over the month of November? A. March B. January C. December D. April	104. Why do you think the sales were highest in December?

Section 12. Regression and the Use of the Graphing Calculator

Note: For guidance in using your calculator to graph a scatterplot and finding the equation of the linear regression (line of best fit), please see the calculator directions sheet included in the back of the review packet.

103. The following table shows the math and science test scores for a group of ninth graders.

Math Test Scores	60	40	80	40	65	55	100	90	85
Science Test Scores	70	35	90	50	65	40	95	85	90

Let's find out if there is a relationship between a student's math test score and his or her science test score.

a. Fill in the table below. Remember the variable quantities are the two variables you are comparing, the lower bound is the minimum, the upper bound is the maximum, and the interval is the scale for each axis.

Variable Quantity	Lower Bound	Upper Bound	Interval

b. Create the scatter plot of the data on your calculator and sketch it here.

c. Write the equation of the line of best fit.

d. Based on the line of best fit, if a student scored an 82 on his math test, what would you expect his science test score to be? Explain how you determined your answers. Use words, symbols or both.

e. Based on the line of best fit, if a student scored a 53 on his science test, what would you expect his math test score to be. Explain how you determined your answer. Use words, symbols or both.

104. Use the chart below of winning times for the women's 200-meter run in the Olympics to answer the following questions.

Year	Time (Seconds)
1964	23.00
1968	22.50
1972	22.40
1976	22.37
1980	22.03
1984	21.81
1988	21.34
1992	21.81

a. Fill in the table below. Remember the variable quantities are the two variables you are comparing, the lower bound is the minimum, the upper bound is the maximum, and the interval is the scale for each axis.

Variable Quantity	Lower Bound	Upper Bound	Interval

b. Create the scatter plot of the data on your calculator and sketch it here.

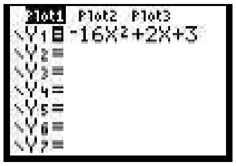
c. Write the equation of the regression line (line of best fit) below. Explain how you determined your equation.

d. The summer Olympics were held in London, England in 2012. According to the line of best fit equation, what would be the winning time for the women's 200-meter run during the 2012 Olympics? Does this answer make sense? Why or why not?

TI-83 Plus/TI-84 Graphing Calculator Tips
How to …

…graph a function

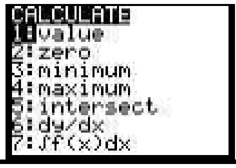
Press the [Y=] key, Enter the function directly using the [X,T,θ,n] key to input *x*. Press the [GRAPH] key to view the function. Use the [WINDOW] key to change the dimensions



and scale of the graph. Pressing [TRACE] lets you move the cursor along the function with the arrow keys to display exact coordinates.

…find the y-value of any x-value

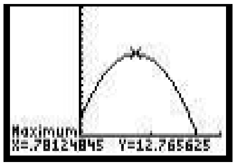
Once you have graphed the function, press CALC [2nd] [TRACE] and select 1:value. Enter the *x*-value. The corresponding *y*-value is displayed and the cursor



moves to that point on the function.

…find the maximum value of a function

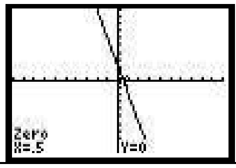
Once you have graphed the function, press CALC [2nd] [TRACE] and select 4:maximum. You can set the left and right boundaries of the area to be examined and guess the maximum value either by entering values



directly or by moving the cursor along the function and pressing [ENTER]. The *x*-value and *y*-value of the point with the maximum *y*-value are then displayed.

…find the zero of a function

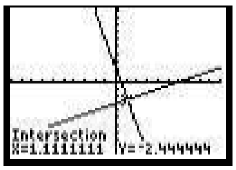
Once you have graphed the function, press CALC [2nd] [TRACE] and select 2:zero. You can set the left and right boundaries of the root to be examined and guess the value either by entering values



directly or by moving the cursor along the function and pressing [ENTER]. The *x*-value displayed is the root.

…find the intersection of two functions

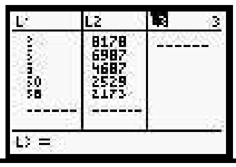
Once you have graphed the function, press CALC [2nd] [TRACE] and select 5:intersect. Use the up and down arrows to move among functions and press [ENTER] to select two. Next,



enter a guess for the point of intersection or move the cursor to an estimated point and press [ENTER]. The *x*-value and *y*-value of the intersection are then displayed.

…enter lists of data

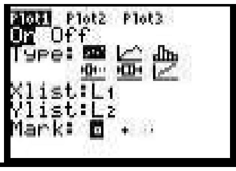
Press the [STAT] key and select 1:Edit. Store ordered pairs by entering the *x* coordinates in L1 and the *y* coordinates in L2. You can calculate new lists. To



create a list that is the sum of two previous lists, for example, move the cursor onto the L3 heading. Then enter the formula L1+L2 at the L3 prompt.

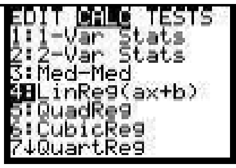
...plot data

Once you have entered your data into lists, press STAT PLOT [2nd] [Y=] and select **Plot1**. Select On and choose the type of graph you want, e.g. scatterplot (points not connected) or connected dot for two variables, histogram for one variable. Press [ZOOM] and select **9:ZoomStat** to resize the window to fit your data. Points on a connected dot graph or histogram are plotted in the listed order.



...graph a linear regression of data

Once you have graphed your data, press [STAT] and move right to select the CALC menu. Select **4:LinReg(ax+b)**. Type in the parameters **L1, L2, Y1**. To enter **Y1**, press [VARS] and move right to select the **Y-VARS** menu. Select **1:Function** and then **1:Y1**. Press [ENTER] to display the linear regression equation and [Y=] to display the function.



...draw the inverse of a function

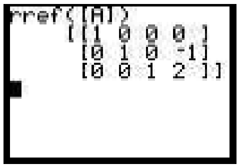
Once you have graphed your function, press **DRAW** [2nd] [PRGM] and select **8:DrawInv**. Then enter **Y1** if your function is in **Y1**, or just enter the function itself.

...create a matrix

From the home screen, press [2nd] [x^{-1}] to select **MATRX** and move right to select the **EDIT** menu. Select **1:[A]** and enter the number of rows and the number of columns. Then fill in the matrix by entering a value in each element. You may move among elements with the arrow keys. When finished, press **QUIT** [2nd] [MODE] to return to the home screen. To insert the matrix into calculations on the home screen, press [2nd] [x^{-1}] to select **MATRX** and select **NAMES** and select **1:[A]**.

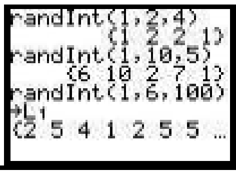
...solve a system of equations

Once you have entered the matrix containing the coefficients of the variables and the constant terms for a particular system, press **MATRX** ([2nd] [x^{-1}]), move to **MATH**, and select **B:rref**. Then enter the name of the matrix and press [ENTER]. The solution to the system of equations is found in the last column of the matrix.



...generate lists of random integers

From the home screen, press [MATH] and move left to select the **PRB** menu. Select **5:RandInt** and enter the lower integer bound, the upper integer bound, and the number of trials, separated by commas, in that order. Press [STO→] and **L1** to store the generated numbers in List 1. Repeat substituting **L2** to store a second set of integers in List 2.



Exponential Functions

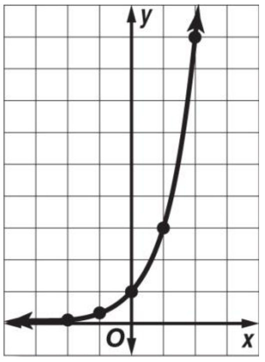
Graph Exponential Functions

Exponential Function	a function defined by an equation of the form $y = ab^x$, where $a \neq 0$, $b > 0$, and $b \neq 1$

You can use values of *x* to find ordered pairs that satisfy an exponential function. Then you can use the ordered pairs to graph the function.

Example 1: Graph $y = 3^x$. Find the *y*-intercept and state the domain and range.

x	*y*
–2	$\frac{1}{9}$
–1	$\frac{1}{3}$
0	1
1	3
2	9

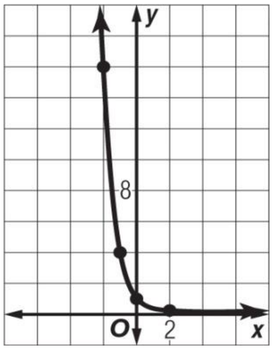


The *y*-intercept is 1.

The domain is all real numbers, and the range is all positive numbers.

Example 2: Graph $y = \left(\frac{1}{4}\right)^x$. Find the *y*-intercept and state the domain and range.

x	*y*
–2	16
–1	4
0	1
1	$\frac{1}{4}$
2	$\frac{1}{16}$



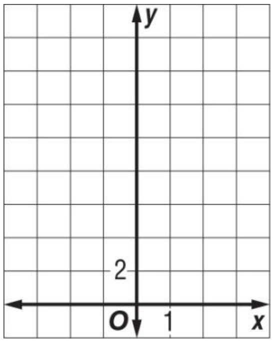
The *y*-intercept is 1.

The domain is all real numbers, and the range is all positive numbers.

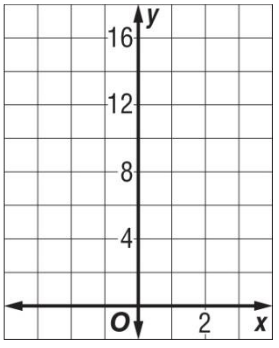
Exercises

Graph each function. Find the *y*-intercept and state the domain and range.

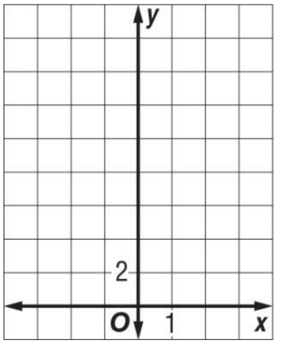
105. $y = 0.3^x$



106. $y = 3^x + 1$



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



Exponential Functions

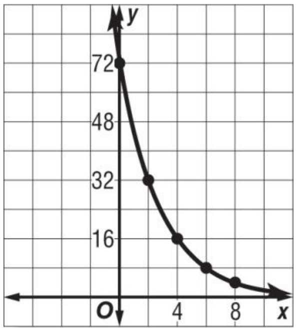
Identify Exponential Behavior It is sometimes useful to know if a set of data is exponential. One way to tell is to observe the shape of the graph. Another way is to observe the pattern in the set of data.

Example : Determine whether the set of data shown below displays exponential behavior. Write *yes* or *no*. Explain why or why not.

x	0	2	4	6	8	10
y	64	32	16	8	4	2

Method 1: Look for a Pattern
The domain values increase by regular intervals of 2, while the range values have a common factor of $\frac{1}{2}$. Since the domain values increase by regular intervals and the range values have a common factor, the data are probably exponential.

Method 2: Graph the Data



The graph shows rapidly decreasing values of *y* as *x* increases. This is characteristic of exponential behavior.

Exercises

Determine whether the set of data shown below displays exponential behavior. Write *yes* or *no*. Explain why or why not.

108.

x	0	1	2	3
y	5	10	15	20

109.

x	0	1	2	3
y	3	9	27	81

110.

x	–1	1	3	5
y	32	16	8	4

111.

x	–1	0	1	2	3
y	3	3	3	3	3

112.

x	–5	0	5	10
y	1	0.5	0.25	0.125