

2018 Dual Enrollment PreCalculus Summer Packet

Greetings Upcoming Fayette Academy (FA) Dual Enrollment (DE) Mathematics Students,
I hope you enjoy your summer vacation and I am looking forward to having you in my class.
Our Math DE classes are composed of 2 University of Tennessee Courses:

MAT 140, "College Algebra and Elementary Functions", offered this Fall 2018
MAT 170, "Trigonometry", offered the following Spring 2019

UT Martin's MAT 140 published syllabus begins with Chapter 3 (Chapters R – 2 topics were covered in Honors PreCalculus and Honors Algebra 2):

<http://www.utm.edu/departments/math/courses/M140Fall16.pdf>

Our FA syllabus will incorporate UT's requirements and include additional details about MAT 140 for Fall.

To help ensure your success in rigorous college-level mathematics, you have mandatory Summer work and preliminary preparations which must be completed prior to the first day of class, August 9, 2018.

- Please join FA Dual Enrollment Google Classroom, **Class code:** pyuqkun. Information for your Summer Packet is listed on Google Classroom.
- Register for MyLab Math (MLM) online (Registration Instructions are on Google Classroom). You may register online prior to purchasing your book with a temporary access code which has a 12-day grace period.
- Purchase your Required Text book: Sullivan's Algebra and Trigonometry Enhanced with Graphing Utilities Plus MyLab Math (MLM) with Pearson eText-- Access Card Package, 7th Edition. The MLM access code is for one year. Your Summer work utilizes the online component.

You may choose purchase the Required Book/MLM package at the Pearson Book Store:

<http://www.mypearsonstore.com/bookstore/algebra-and-trigonometry-enhanced-with-graphing-utilities-9780134265124>

- **Option 1:** hard cover text + MyLab Math access code (1-year);
ISBN-13: 978-0-13-426512-4
\$270.25
- **Option 2:** 3-hole punched & loose-leaf version + MyLab Math access code (1-year);
ISBN-13: 978-0-13-426820-0
\$191.90

** **Mandatory** Dual Enrollment Summer Work due 8/9/2018: This is a review of Algebra II concepts:

- If you have access to a computer, please use MyLab Math.
 - Complete Chapter O MLM Homework
 - Summer Packet Read Chapter R, MLM Homework: 45 exercises
 - Summer Packet Read Chapter 1, MLM Homework: 46 exercises
 - Summer Packet Read Chapter 2, MLM Homework: 26 exercises
- If you do not have access to a computer, you must complete the DE – Summer Packet by hand. This is also on Google Classroom.
 - MAT 140 Summer Packet 1, 86 exercises from Chapter R
 - MAT 140 Summer Packet 2, 78 exercises from Chapter 1
 - MAT 140 Summer Packet 3, 20 exercises from Chapter 2

Helpful Web sites: for Algebra <http://www.purplemath.com/modules/index.htm>
for Trig: <https://www.khanacademy.org/math/trigonometry>

If you have any questions, please email me at adavis@fayetteacademy.com

Cordially,

Annita Davis, Ph.D.

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Student Registration Instructions

To register for 2018 Dual Enrollment PreCalculus :

1. Go to www.pearson.com/mylab .
2. Under Register, select **Student** .
3. Confirm you have the information needed, then select **OK! Register now** .
4. Enter your instructor's course ID: **davis34968** , and **Continue** .
5. Enter your existing Pearson account **username** and **password** to **Sign In** .
You have an account if you have ever used a MyLab or Mastering product.
 - » If you don't have an account, select **Create** and complete the required fields.
6. Select an access option.
 - » Get temporary access code
 - » Enter the access code that came with your textbook or that you purchased separately from the bookstore.
 - OR** Buy access using a credit card or PayPal.
7. From the You're Done! page, select **Go To My Courses** .
8. On the My Courses page, select the course name **2018 Dual Enrollment PreCalculus** to start your work.

To sign in later:

1. Go to www.pearson.com/mylab .
2. Select **Sign In** .
3. Enter your Pearson account **username** and **password**, and **Sign In** .
4. Select the course name **2018 Dual Enrollment PreCalculus** to start your work.

To upgrade temporary access to full access:

1. Go to www.pearson.com/mylab .
2. Select **Sign In** .
3. Enter your Pearson account **username** and **password**, and **Sign In** .
4. Select **Upgrade access** for **2018 Dual Enrollment PreCalculus** .
5. Enter an access code or buy access with a credit card or PayPal.

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R. Review Basics

R.1 Real Numbers:

- Learning Objectives:
1. Work with sets
 2. Classify numbers
 3. Evaluate numerical expressions
 4. Work with properties of real numbers

Problems:

1. Use $A = \{0, 1, 6, 7, 9\}$, $B = \{2, 3, 8, 9\}$, and $C = \{0, 1, 2, 4, 6, 7\}$ to find the set $(A \cup B) \cap C$.
2. Use $U =$ universal set $= \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $B = \{4, 6, 7, 8, 9\}$, and $C = \{1, 4, 5, 6, 9\}$ to find the set $\overline{B \cap C}$.
3. List the numbers in the set $\left\{8, \frac{3}{4}, \sqrt{5}, \pi, 1, -9\right\}$ that are
(a) Natural numbers (b) Integers (c) Rational numbers (d) Irrational numbers (e) Real numbers.
4. Approximate 86.7339: (a) rounded to 3 decimal places (b) truncated to 3 decimal places.
5. Evaluate: (a) $9 - [4 \cdot 5 + 2 \cdot (10 - 9)]$ (b) $\frac{\left(\frac{17}{20}\right)}{\left(\frac{11}{12}\right)}$
6. Use the Distributive Property to remove the parentheses from $(x - 3)(x + 1)$.

R.2 Algebra Essentials

- Learning Objectives:
1. Graph inequalities
 2. Find distance on the real number line
 3. Evaluate algebraic expressions
 4. Determine the domain of a variable
 5. Use the laws of exponents
 6. Evaluate square roots
 7. Use a calculator to evaluate exponents
 8. Use scientific notation

Problems:

1. Replace the question mark by $<$, $>$, or $=$.
(a) $\frac{8}{9} ? 0.89$ (b) $\frac{5}{6} ? 0.83$
2. Graph $x \geq -3$ on the number line.

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3. On the real number line, what is the distance between -5 and 2 ?

4. Evaluate if $x = -6$ and $y = 2$:

(a) $\frac{4x+3y}{6+6y}$

(b) $|2x-4y|$

5. Determine the value(s) of x that must be excluded from the domain of the variable in

$$\frac{x^2+8x-3}{x^3-4x}$$

6. Simplify each expression:

(a) 10^{-2}

(b) $8^{-3} \cdot 8$

(c) $\sqrt{(-4)^2}$

(d) $(x^9 y^{-4})^6$

(e) $\left(\frac{4x^{-5}}{7x^{-8}}\right)^{-3}$

7. Write in scientific notation:

(a) 731.3

(b) 0.000442

R.3 Geometry Essentials

- Learning Objectives:**
1. Use the Pythagorean Theorem and its converse
 2. Know geometry formulas
 3. Understand congruent triangles and similar triangles

Problems:

1. The legs of a right triangle have lengths of 9 and 12 . Find the hypotenuse.

2. Find the area of a triangle with height 7 inches and a base 8 inches.

3. Find the **exact** area and circumference of a circle with a radius of 4 meters.

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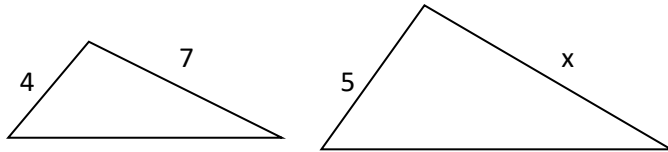
R. Review Basics:

4. Find the volume and surface area of a sphere of radius 9 centimeters.

(a) Volume:

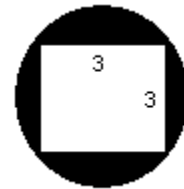
(b) Surface Area:

5. Given that the following are similar triangles, find x .



6. How many feet does a wheel with a diameter of 20 inches travel after 3 revolutions?

7. Find the area of the shaded region if the side of the square is 3 inches.



R.4 Polynomials

Learning Objectives:

1. Recognize monomials
2. Recognize polynomials
3. Add and subtract polynomials
4. Multiply polynomials
5. Know formulas for special products
6. Divide polynomials using long division
7. Work with polynomials in two variables

Problems:

1. State whether the expression is a polynomial. If it is, state the degree.

(a) $3x^3 - 7x + 2$

(b) $3x - \frac{2}{x}$

(c) $\sqrt{2}x^2 - 3\pi$

(d) $\sqrt{2x} + 5x$

2. Simplify each expression.

(a) $(7x^3 - 6x^2 + 3x + 8) - (6x^2 - 2x + 7)$

(b) $(9x^5 + 2x^3 + 8x) + (5x^4 - 9x^3 + 9x^2)$

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R. Review Basics

3. Simplify each expression.

$$(a) (x+2)(x^2+3x-2)$$

$$(b) (5x+3)(x-4)$$

$$(c) (x-2y)(x+y)$$

$$(d) (x+8)^2$$

$$(e) (x+2)(x-2)$$

$$(f) (x-2)^3$$

4. Divide $5x^4 - 3x^2 + 8x + 6$ by $x^2 + 8$.

R.5 Factoring Polynomials- Factor the following

Learning Objectives: 1. Factor the difference of 2 squares and the sum and difference of 2 cubes

2. Factor perfect squares

3. Factor a second-degree polynomial: $x^2 + Bx + C$

4. Factor by grouping

5. Factor a second-degree polynomial: $Ax^2 + Bx + C$, $A \neq 1$

6. Complete the square

Problems:

1. (a) $x^2 - 36$

(b) $x^2 - 49$

(c) $x^3 - 64$

2. (a) $x^2 + 12x + 36$

(b) $x^2 - 16x + 64$

(c) $81x^2 + 18x + 1$

3. (a) $x^2 - 10x + 24$

(b) $x^2 - 3x - 54$

(c) $x^2 + x - 30$

4. (a) $18x^2 + 12x + 15x + 10$

(b) $6x^2 + 21x + 8x + 28$

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5. (a) $36x^2 + 36x + 9$

(b) $54x^4y - 16xy^4$

6. Determine the number that should be added to complete the square. Then factor the expression: $r^2 + \frac{1}{4}r$.

R.6 Synthetic Division

Learning Objectives: 1. Divide polynomials using synthetic division

Problems:

1. For the given expression, use synthetic division to find the quotient and the remainder.

(a) $x^5 - x^4 + x^3 - 2x^2 + 3x - 6$ divided by $x + 1$ (b) $12x^3 + x^2 - \frac{9}{2}x - 1$ divided by $x + \frac{1}{2}$

(c) $x^4 - 16$ divided by $x + 2$

2. Use synthetic division to determine whether $x - c$ is a factor of the given polynomial.

(a) $12x^3 - 15x^2 - 27x + 60$; $x - 2$ (b) $2x^4 - x^3 - 4x + 2$; $x - \frac{1}{2}$ (c) $9x^6 + 84x^3 + 96$; $x + 2$

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R.7 Rational Expressions

- Learning Objectives:**
1. Reduce a rational expression to lowest terms
 2. Multiply and divide rational expressions
 3. Add and subtract rational expressions
 4. Use the Least Common Multiple Method
 5. Simplify complex rational expressions

Problems:

1. Reduce each rational expression to lowest terms.

$$(a) \frac{y^2 - 64}{6y^2 - 36y - 96}$$

$$(b) \frac{x^2 + 3x - 54}{6 - x}$$

2. Perform the indicated operation and simplify the result.

$$(a) \frac{3x + 21}{9x^7} \cdot \frac{x}{x^2 - 49}$$

$$(b) \frac{x^2 - 3x - 10}{x^2 + 3x - 40} \cdot \frac{x^2 + 5x - 24}{x^2 + 10x + 16}$$

$$(c) \frac{\left(\frac{2x}{x^2 - 49}\right)}{\left(\frac{3x - 15}{9x + 63}\right)}$$

$$(d) \frac{\left(\frac{x^2 + 11x + 18}{x^2 - 11x + 18}\right)}{\left(\frac{x^2 + 7x - 18}{x^2 - 7x - 18}\right)}$$

$$(e) \frac{x^2}{5x - 7} - \frac{4}{5x - 7}$$

$$(f) \frac{5}{x - 8} + \frac{x}{8 - x}$$

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$$(g) \frac{x}{x+9} + \frac{4x-5}{x-9}$$

$$(h) \frac{x}{x^2-8x+7} - \frac{x}{x^2-2x-35}$$

$$(i) \frac{4x}{x^2-9} - \frac{6}{x^2+x-12}$$

3. Perform the indicated operation and simplify the result.

$$(a) \frac{3 + \frac{1}{x}}{6 - \frac{1}{x}}$$

$$(b) \frac{\frac{x-6}{x} + \frac{x-1}{7x-3}}{x+1} - \frac{x+1}{x}$$

R.8 nth Roots; Rational Exponents

- Learning Objectives:**
1. Work with n th roots
 2. Simplify radicals
 3. Rationalize denominators
 4. Simplify expressions with rational exponents

Problems:

1. Simplify each expression. Assume all variables are positive.

$$(a) \sqrt[3]{216}$$

$$(b) \sqrt[3]{-343}$$

$$(c) \sqrt[4]{\frac{x^{10}y^{10}}{x^2y^6}}$$

$$(d) 5\sqrt{7} + 6\sqrt{7}$$

$$(e) (\sqrt{7} + 5)(\sqrt{7} - 6)$$

$$(f) 3\sqrt[3]{2} - 8\sqrt[3]{128}$$

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2. Rationalize the denominator.

$$(a) \frac{4}{\sqrt{6}}$$

$$(a) \frac{4}{\sqrt{6}}$$

$$(c) \frac{\sqrt{6}}{6-\sqrt{3}}$$

3. Simplify each expression. Answers should have only positive exponents. Assume all variables are positive.

$$(a) 64^{2/3}$$

$$(b) (-216)^{1/3}$$

$$(c) \left(\frac{64}{512}\right)^{2/3}$$

$$(d) (x^4 y)^{1/3} (xy^4)^{2/3}$$

$$(e) \frac{(-3y^{3/4})^4}{y^{3/2}}$$

$$(f) \left(\frac{x^{1/3}}{x^{-1/6} y^{-2/3}}\right)^{-3}$$

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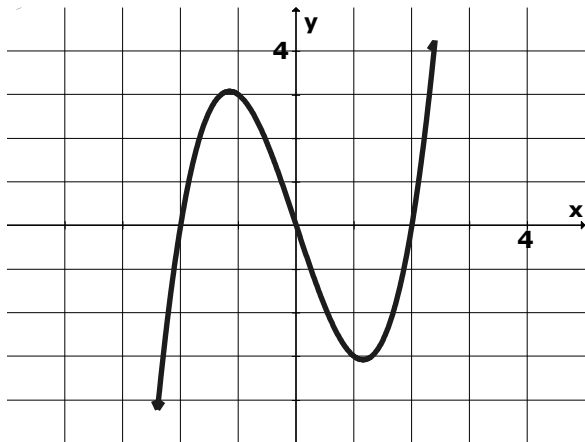
1. Graphs, Equations, & Inequalities

1.1 The Distance & Midpoint Formulas; Graphing Utilities; Introduction to Graphing Equations:

- Learning Objectives:**
1. Use the Distance Formula
 2. Use the Midpoint Formula
 3. Graph Equations by Plotting Points
 4. Graph Equations Using a Graphing Utility
 5. Use a Graphing Utility to Create Tables
 6. Find Intercepts from a Graph
 7. Use a Graphing Utility to Approximate Intercepts

Examples:

1. Determine the distance $d(P_1, P_2)$ between the points $P_1(1.4, 3.2)$ and $P_2(-.4, 1.7)$. Round to 2 decimal places.
2. Find the midpoint of the line segment joining the points $P_1(1.4, 3.2)$ and $P_2(-.4, 1.7)$.
3. Determine whether the triangle formed by points $A=(-2, 2)$, $B=(2, -1)$, and $C=(5, 4)$ form a right triangle.
4. The graph of an equation is given. List the intercepts of the graph.



5. Graph $2x - 3y = 56$ using a graphing utility.

1.2 Solve Equations Using a Graphing Utility; Linear & Rational Equations

Learning Objectives:

1. Solve Equations Using a Graphing Utility
2. Solve Linear Equations
3. Solve Rational Equations
4. Solve Problems That Can Be Modeled by Linear Equations

Examples:

Solve each equation algebraically. Verify your results using a graphing utility.

1. (a) $6 + 3x = 9x + 6$ (b) $2x - (3x + 3) = 2x - 18$ (c) $\frac{x+4}{2} + \frac{x+1}{3} = 10$

2. (a) $\frac{-1}{x+1} = \frac{1}{3x+3} - \frac{2}{x-4}$ (b) $\frac{x}{x-6} + 1 = \frac{6}{x-6}$

(c) $\frac{5}{x-2} = \frac{-3}{x+2} + \frac{28}{(x-2)(x+2)}$

3. Solve the formula for the indicated variable: $S = \pi(r_1 + r_2)L$, for r_2

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4. A motorcycle repair shop charged a customer \$404, listing \$74 for parts and the remainder for labor. If the cost of labor is \$27.50 per hour, how many hours of labor did it take to repair the motorcycle?

1.3 Quadratic Equations

Learning Objectives:

1. Solve quadratic equations by factoring
2. Solve quadratic equations by the square root method
3. Solve quadratic equations by completing the square
4. Solve quadratic equations using the quadratic formula
5. Solve problems that can be modeled by quadratic equations

Examples:

1. Find the real solutions by factoring: $3x^2 + 4x - 4 = 0$.
2. Find the real solutions by using the square root method: $(4x - 1)^2 - 16 = 0$.
3. Find the real solutions by completing the square: $x^2 + 4x - 10 = 0$.
4. Find the real solutions by using the quadratic formula: $3x^2 - 5x - 7 = 0$.
5. A ball is thrown vertically upward from the top of a building 48 feet tall with an initial velocity of 32 feet per second. The distance s (in feet) of the ball from the ground after t seconds is $s = 48 + 32t - 16t^2$.
 - (a) After how many seconds does the ball strike the ground?
 - (b) After how many seconds will the ball pass the top of the building on its way down?

1.4 Complex Numbers; Quadratic Equations in the Complex Number System

Learning Objectives:

1. Add, subtract, multiply, and divide complex numbers
2. Solve quadratic equations in the complex number system

Examples:

1. Write each expression in the standard form $a + bi$.
 - (a) $(2 - 9i) + (9 + 7i)$
 - (b) $(2 - 4i) - (5 + 2i)$
 - (c) $(7 - 4i)(2 + i)$
 - (d) $\frac{4}{7 - 4i}$
 - (e) $\frac{6 - i}{7 + i}$
 - (f) i^{18}
 - (g) $(1 + i)^3$
2. Perform the indicated operation and express the answer in the form $a + bi$.
 - (a) $\sqrt{-100}$
 - (b) $\sqrt{(2 + 5i)(2 - 5i)}$
3. Solve each equation in the complex number system.
 - (a) $x^2 + 5 = 0$
 - (b) $x^2 + 2x + 7 = 0$
 - (c) $2x^2 - 4x - 5 = 0$
 - (d) $x^2 - 2x + 5 = 0$

1.5 Radical Equations; Equations Quadratic in Form; Absolute Value Equations; Factorable Equations

Learning Objectives:

1. Solve radical equations
2. Solve equations quadratic in form
3. Solve absolute value equations
4. Solve equations by factoring

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Examples:

1. Find the real solutions of each equation.

$$(a) \sqrt{2x-4} = 4 \quad (b) \sqrt{7-6x} = x \quad (c) x = 2\sqrt{6x-36}$$

$$(d) \sqrt{x^2-x-7} = x+3 \quad (e) \sqrt{3x+1} - \sqrt{x-1} = 2 \quad (f) (3x+3)^{1/2} = 9$$

2. Find the real solutions of each equation.

$$(a) 14x^4 - 5x^2 - 1 = 0 \quad (b) (x+6)^2 + 3(x+6) + 2 = 0 \quad (c) x + \sqrt{x} = 30$$

$$(d) \frac{1}{(x+6)^2} = \frac{1}{(x+6)} + 12 \quad (e) 8x^{2/3} - 39x^{1/3} - 5 = 0$$

3. Solve each equation.

$$(a) |5x-10| = 15 \quad (b) \left| \frac{2}{3}x + 6 \right| = 12 \quad (c) |4-3x| - 4 = 1 \quad (d) |x^2 + x - 1| = 1$$

4. Find the real solutions of each equation by factoring.

$$(a) x^3 - 49x = 0 \quad (b) 7x^3 = 2x^2 \quad (c) x^3 - 14x^2 + 48x = 0 \quad (d) x^3 + x^2 - 25x - 25 = 0$$

1.6 Problem solving: Interest, Mixture, Uniform Motion, Constant Rate Job

Learning Objectives:

1. Translate verbal descriptions into mathematical expressions
2. Solve interest problems
3. Solve mixture problems
4. Solve uniform motion problems
5. Solve constant rate job problems

Examples:

1. Translate the following sentence into a mathematical equation.

“The area, A , of a circle is the product of the number π and the square of the radius, r .”

2. Betsy, a recent retiree, requires \$6,000 per year in extra income. She has \$70,000 to invest and can invest in B-rated bonds paying 17% per year or in a CD paying 7% per year. How much money should be invested in each to realize exactly \$6,000 in interest per year?
3. A nut store normally sells cashews for \$4 per pound and peanuts for \$1.50 per pound. At the end of the month the peanuts had not sold well, so, in order to sell 60 pounds of peanuts, the manager decided to mix the 60 pounds of peanuts with some cashews and sell the mixture for \$2.50 per pound. How many pounds of cashews should be mixed with the peanuts to ensure no change in the profit?
4. A boat can maintain a constant speed of 34 mph relative to the water. The boat makes a trip upstream to a certain point in 21 minutes; the return trip takes 13 minutes. What is the speed of the current?
5. Trent can deliver his newspapers in 60 minutes. It takes Lois 40 minutes to do the same route. How long would it take them to deliver the newspapers if they work together?

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1.7 Solving Inequalities

Learning Objectives:

1. Use interval notation
2. Use properties of inequalities
3. Solve linear inequalities algebraically and graphically
4. Solve combined inequalities algebraically and graphically
5. Solve absolute value inequalities algebraically and graphically

Examples:

1. Write each inequality using interval notation.

$$(a) -4 < x \leq 5 \quad (b) 0 < x < 4 \quad (c) 5 \leq x < 12 \quad (d) 8 \leq x \leq 16$$

2. Write each interval as an inequality involving x .

$$(a) (-5, 10) \quad (b) [4, 16] \quad (c) [0, 6) \quad (d) (-5, 1]$$

3. Solve each inequality. Express the answer in interval notation.

$$(a) x + 7 < 1 \quad (b) 3x - 9 \geq 3 + x \quad (c) 8 - 7(1 - x) \leq 7 \quad (d) \frac{x}{4} \geq 3 - \frac{x}{16}$$

4. Solve each inequality. Express the answer in interval notation.

$$(a) -15 \leq 9 - 4x \leq 25 \quad (b) -4 < \frac{4x - 8}{5} < 0 \quad (c) -2 < 1 - \frac{1}{2}x < 5$$

$$(d) (x + 5)(x - 7) > (x - 5)(x + 5) \quad (e) (8x + 4)^{-1} < 0 \quad (f) 0 < \frac{5}{x} < \frac{8}{9}$$

5. Solve each absolute value inequality.

$$(a) |3x| \leq 21 \quad (b) |4x - 3| \geq 9 \quad (c) |2 - 6x| - 5 < 1 \quad (d) -|3x - 3| \geq -8$$

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2. Graphs

2.1 Intercepts; Symmetry; Graphing Key Equations:

Learning Objectives:

1. Find intercepts algebraically from an equation
2. Test for an equation for symmetry
3. Know how to graph key equations

Examples:

1. Find the intercepts of the equation $y = 2x - 1$ and then graph by plotting points.
2. List the intercepts, test for symmetry, and graph each equation.

$$(a) y^2 - x - 4 = 0 \quad (b) y = \frac{x}{x^2 - 4}$$

3. If $(a, 6)$ is a point on the graph of $y = x^2 - x$, what is a ?

2.2 Lines

Learning Objectives:

1. Calculate and interpret the slope of a line
2. Graph lines given a point and the slope
3. Find the equation of a vertical line
4. Use the point-slope form of a line; identify horizontal lines
5. Write the equation of a line in slope-intercept form
6. Find the equation of a line given two points
7. Graph lines written in general form using intercepts
8. Find equations of parallel lines
9. Find equations of perpendicular lines

Examples:

1. Determine the slope of the line containing the points $(-5, 4)$ and $(0, 7)$.
2. Graph the line containing the point $(2, 4)$ with slope $m = \frac{-2}{3}$.
3. Write an equation of the line satisfying the given conditions:
 - (a) Slope = $\frac{3}{4}$, containing the point $(-2, 4)$
 - (b) Containing the points $(4, 2)$ and $(3, -4)$.
 - (c) x -intercept = 3, y -intercept = -2
 - (d) Vertical line containing $(5, -1)$.
 - (e) Parallel to the line $3x - 4y = 5$ and containing the point $(3, -6)$.
4. Find the slope and y -intercept of the line $4x - 6y = -3$.
5. Find the intercepts and graph the line $-2x + y = 4$.

2.3 Circles

Learning Objectives:

1. Write the standard form of the equation of a circle
2. Graph a circle by hand and by using a graphing utility
3. Work with the general form of the equation of a circle

Examples:

1. Write the standard form and general form of the equation of each circle with radius r and center (h, k) . Graph each circle.

2018 Dual Enrollment PreCalculus Summer Packet

$$(a) r = 3; (h, k) = (-2, 3). \quad (b) r = \frac{2}{3}; (h, k) = (0, 0).$$

2. Find the center (h, k) and radius r of each circle.

$$(a) 2(x-2)^2 + 2(y+3)^2 = 8 \quad (b) x^2 + y^2 - 6x + 2y + 4 = 0$$

3. Find the general form of the equation of each circle.

(a) Center $(2, -3)$ and containing the point $(0, 4)$.

(b) Endpoints of a diameter at $(6, 10)$ and $(-4, -4)$.

2.4 Variation

Learning Objectives:

1. Construct a model using direct variation
2. Construct a model using inverse variation
3. Construct a model using joint variation or combined variation

Examples:

1. The monthly payment p on a mortgage varies directly with the amount borrowed B . If the monthly payment on a 30-year mortgage is \$5.75 for every \$1000 borrowed, find a function $p=p(B)$ that relates the monthly payment p to the amount borrowed B for a mortgage with the same terms. Then find the monthly payment p when the amount borrowed B is \$225,000.
2. The length of a violin string varies inversely as the frequency of its vibrations. If a string 8 inches long vibrates at a frequency of 640 cycles per second, what is the frequency of a string that is 10 inches long?
3. The volume of a cone V varies jointly as its height h and the square of its radius r . A cone with a radius of 4 cm, and a height of 6 cm, has a volume of 32π . Find the volume of a cone having a radius of 15 cm and a height of 30 cm.