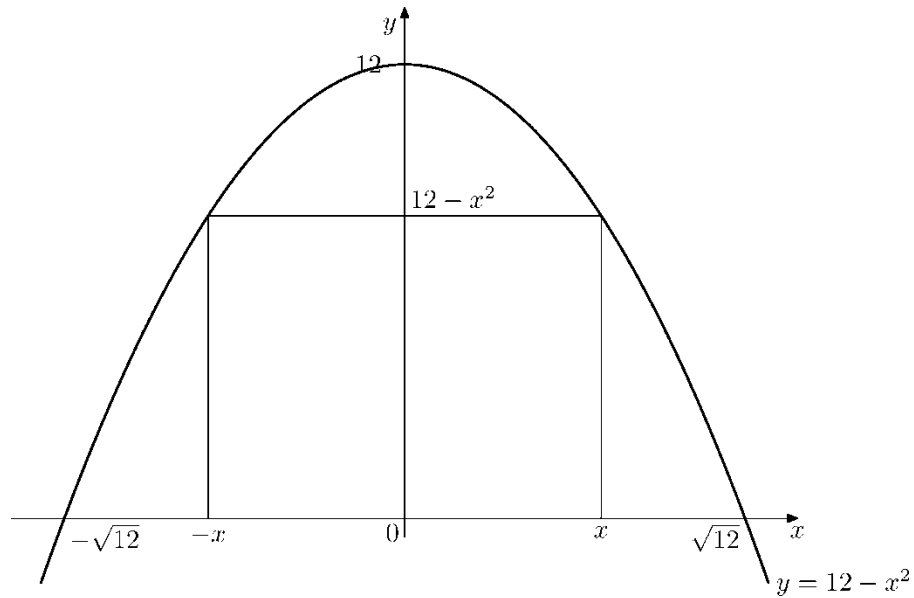




Lawrence High School's Honors Pre-Calculus 2019 Summer Assignment





LAWRENCE TOWNSHIP PUBLIC SCHOOLS

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Welcome to Pre-Calculus Honors:

The purpose of this summer assignment is to help you review important algebraic concepts to best prepare you for the Pre-Calculus Honors curriculum this coming school year. The topics covered in this course are abstract, but serve as a foundation for understanding further applications of mathematics such as Calculus and other college level math courses. The material included in this assignment is the foundation for the first unit of study and the course. The completion of this packet should be done independently while using resources that are available to you (notes, internet, textbooks, etc.), and it is recommended that you review one or two concepts a day and complete a few problems each day. Do not try to complete the entire packet the day before it is due.

Google Classroom Group Code:

- Go to www.classroom.google.com
- Click on *I'm a Student*
- Enter access code to access the class.
- **CODE: kipxbu**

This Google group has been established to provide you, the students, with support as a group. If you are struggling with concepts/material, there is a blog option to post questions to one another. In addition, you have the educational resources listed below for additional assistance. Remember the math course from the current school year is the prerequisite course for the course you have enrolled in for the fall. Your personal notebook and handouts from this year's class are resources that are at your disposal.

- **THIS PACKET WILL BE GRADED** and **THERE WILL BE A QUIZ ON THE MATERIAL** in the first two weeks of school in September.
- It will be worth 30 points and will be the first major assignment grade for the first quarter.
- Each individual problem will be graded on a scale from 0 to 1 using the rubric below.
- Some class time will be spent reviewing this packet and covering the material.

Directions:

- Complete ALL problems.
- You cannot use a calculator or other electronic device unless so instructed.
- You may use a calculator to approximate an answer (when asked) or to check your answer.
- Show all work for every problem on a separate piece of paper.
- Your work should be neatly organized, clearly labeled and done in chronological order.
- Circle or box your final answer.

Resources:

For additional examples and support you can reference any of the sites listed below.

- KhanAcademy.com
- Youtube.com or Teachertube.com
- MathIsPower4u.com
- IXL.com



Scoring Criteria

To earn a positive score, each problem must be presented neatly and organized on a separate sheet of paper, with the final answers boxed (or circled).

1 Point

All necessary work is displayed for each problem. Both the answer and solution process are correct, or a few minor errors are present.

½ Point

Any combination of these scenarios satisfy a ½ :

- Not all necessary steps are provided;
- One major error is present within the body of the solution;
- The general solution process is correct, but there are several minor errors.

0 Points

All possible scenarios satisfy a 0:

- An answer is given (whether correct or not), but no work is provided. Important elements of the problem may also be missing (like graphs, equations, tables, diagrams, etc.
- The problem has 2 or more major/egregious errors.
- The problem is not presented neatly, and/ or it is not organized on a separate sheet of paper. It is also possible that the problem's final answer is not boxed (or circled).

Based on this rubric, your grade on the assignment is calculated out of 30 points.

I. Geometry Topics

- Midpoint formula: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

- Median of a Δ : A segment from a vertex to the midpoint of the opposite side.

- Angle Bisector of a Δ : A segment from a vertex which bisects the angle.

- Perpendicular Bisector: A line passing through the midpoint of and perpendicular to a segment.

- Altitude of a Δ : A segment from a vertex perpendicular to the opposite side.

- Equations of a line:

1. Slope intercept: $y = mx + b$,

where $\text{slope} = \frac{y_1 - y_2}{x_1 - x_2}$

2. Point slope: $y - y_1 = m(x - x_1)$

3. Standard: $Ax + By = C$

- Distance formula:

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$



Directions - State all linear equations in Standard Form unless otherwise stated.

1. Given $\triangle ABC$ with A (-5, 4), B (1, 6) and C (3, 8), write the equation of the median from point C.
2. Write the equation of the line parallel to the line $4x - 6y = -1$ and contains the x-intercept of $3x - 2y = 12$.
3. Write the equation of the line in slope- intercept form, through (2, -4) and perpendicular to $x - 2y = 7$
4. Find the value of "a" if the line containing the point (a, -3a) has a y-intercept of 7 and a slope of $-\frac{2}{3}$.
5. Given the distance between (x, 1) and (-2, 5) is $2\sqrt{7}$. Find the value(s) of x. Leave your answer in simplest form.
6. Write the equation of the perpendicular bisector of the segment joining A (-5, 4) and B (3, -6).

II. Quadratics

A. Factoring - Strategies to try when Factoring:

- GCF
- Difference of two squares
- Sum/ Difference of cubes
- Guess and Check
- Grouping

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

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



Directions - Factor completely each of the following:

7. $4x^2 + 27x + 35$	8. $-28y^2 + 7z^2$
9. $x^3 - 2x^2 - 9x + 18$	10. $8a^4 + 27ab^3$

B. Equations - Since the following are equations, we can now go a step further and solve for x by factoring or using the quadratic formula.

Directions - Solve each of the following:

11. $-3x^2 - 5x + 12 = 0$	12. $3x^2 + 5x = 6$
13. $x^2 + 2x + 3 = 0$	14. $30x^4 - 40x^2 + 10 = 0$

C. Graphing - To graph a quadratic equation in standard form, $y = ax^2 + bx + c$, find the important points of the graph by following the steps:

Y-intercept: If a point is the y-intercept of the curve, then that is the point at which the graph crosses the y-axis. Since this point is on the y-axis, then the x-coordinate must be 0. Substitute zero in for x and solve for y .

Vertex: x-coordinate of the vertex: $x = \frac{-b}{2a}$.
y-coordinate of the vertex: substitute the value found for the x-coor. into the original equation and solve for y .

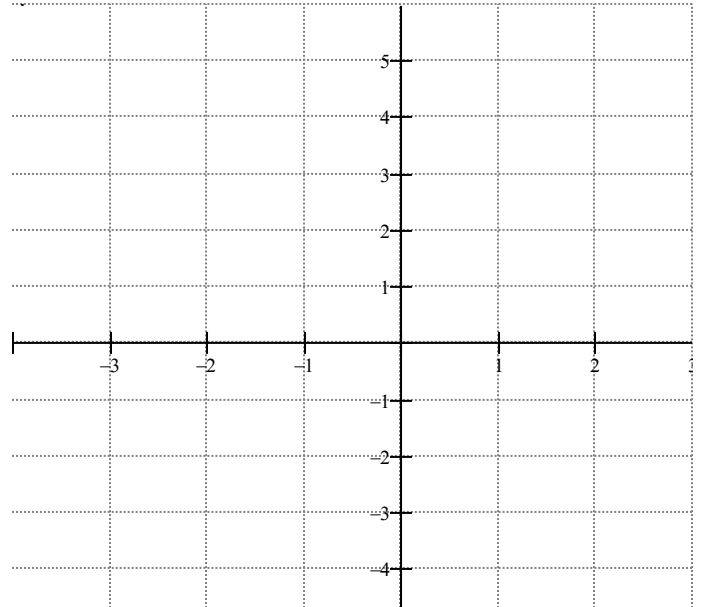
X-intercepts: If a point is an x-intercept of the curve, then it is a point at which the graph crosses the x-axis. Since these points are on the x-axis, then the y-coordinates must be 0. Substitute zero in for y and solve for x by factoring or using the quadratic formula.



Do Not Use a Graphing Calculator

15. Graph $y = -3x^2 - 6x + 2$ and state:

- a. vertex
- b. y-intercept
- c. x-intercepts



III. Systems

Substitution or Linear Combination (Elimination) can be used to solve systems of equations.

- If there is a solution to the system, then the equations are representing intersecting lines.
- If both variables cancel out and an equation is formed that is never true, then there is no solution and the lines never intersect. Lines that never intersect are parallel lines.
- If both variables cancel out and an equation is formed that is always true, then there are infinitely many solutions and the equations must represent the same line.

Directions - Solve each of the following.

- Explain what the solution tells us about the lines represented by the equations.

16. $3x - 4y = 2$
 $-x + 3y = 1$

17. $-x + y = 3$
 $2x - 2y = -6$

Solution: _____
Explanation:

Solution: _____
Explanation:



IV. Exponents

Directions - Simplify using only positive exponents and no calculator!!!

Properties:

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

$$(a^m)^n = a^{m \cdot n}$$

$$a^{\frac{p}{r}} = \sqrt[r]{a^p}$$

$$a^{-n} = \frac{1}{a^n}$$

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

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

18. $\left(\frac{81}{64}\right)^{-\frac{1}{2}}$

19. $(27^{-2})^{-\frac{1}{3}}$

20. $\frac{(3x^2)^{-1}}{6x^{-3}}$

21. a. -2^4

22. $\frac{3^{-5}3^{10}}{3^2}$

24. $(4^{-1} + 2^{-1})^2$

b. $(-2)^4$

V. Rational Algebraic Expressions

Multiplication:

- Factor numerator and denominator completely.
- Cancel common factors in the numerator and denominator.

Division:

- Multiply by the reciprocal then follow rules for multiplication

Addition and Subtraction:

- Find the least common denominator
- Write each fraction with the LCD
- Add / subtract numerators
- Factor if possible, Reduce

Directions – Simplify the following:

25. $\frac{4x^2 + 20}{9 - 6x - 3x^2} \div \frac{x + 5}{x^2 - 9}$

26. $\frac{6x}{3x-1} - \frac{4x}{2x+5}$

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



28. $5 + \frac{1}{x} - \frac{6}{x^2}$
 $\frac{2}{x} - \frac{2}{x^2}$

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

Directions - Solve each of the following.

30. $\frac{5}{x-5} = \frac{x}{x-5} - 1$

31. $\frac{3}{x-2} = \frac{1}{x-1} + \frac{7}{x^2-3x+3}$

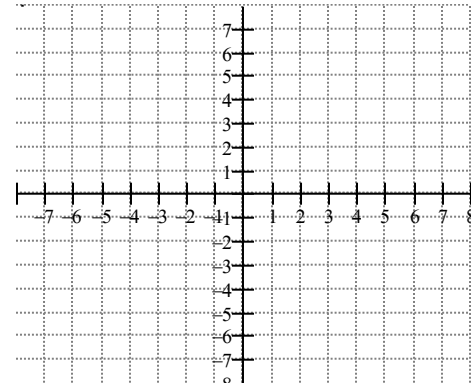
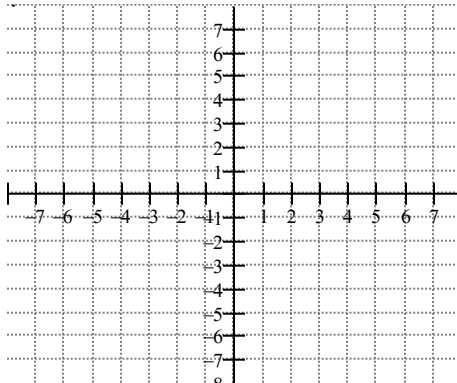
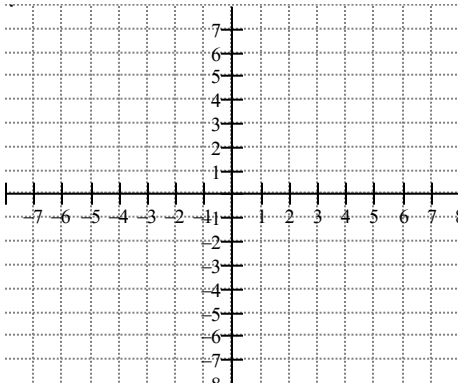
VII. Quick Graphs:

Directions - Graph each of the following.

32. $y = x + 3$

33. $y = (x+2)^2 + 1$

34. $y = |x-2| - 1$



Domain _____

Domain _____

Domain _____

Range _____

Range _____

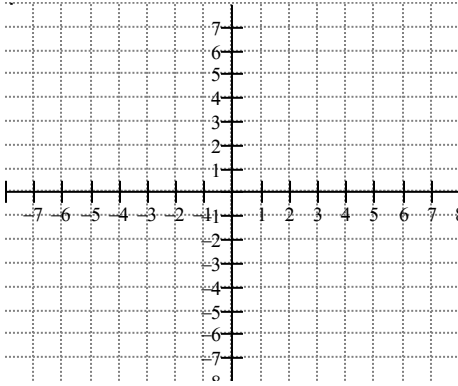
Range _____



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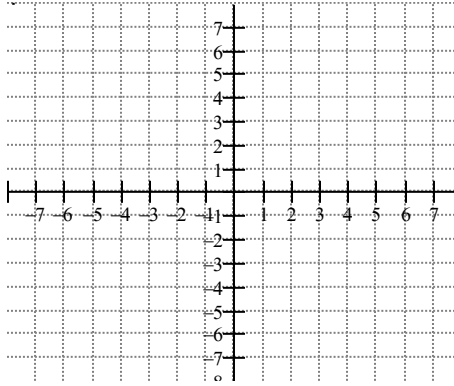
35. $y = \sqrt{x}$



Domain _____

Range _____

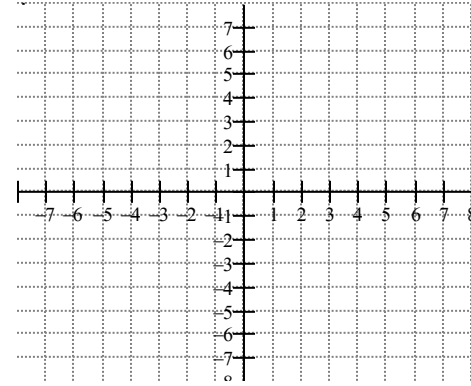
36. $y = x^3$



Domain _____

Range _____

37. $y = \sqrt{x-2}$



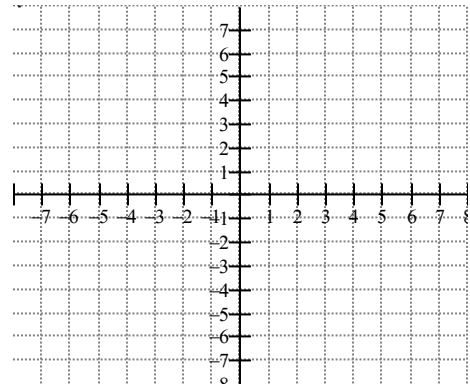
Domain _____

Range _____

38. $f(x) = \begin{cases} x^2 & x < 0 \\ x+2 & 0 \leq x \leq 3 \\ 4 & x > 3 \end{cases}$

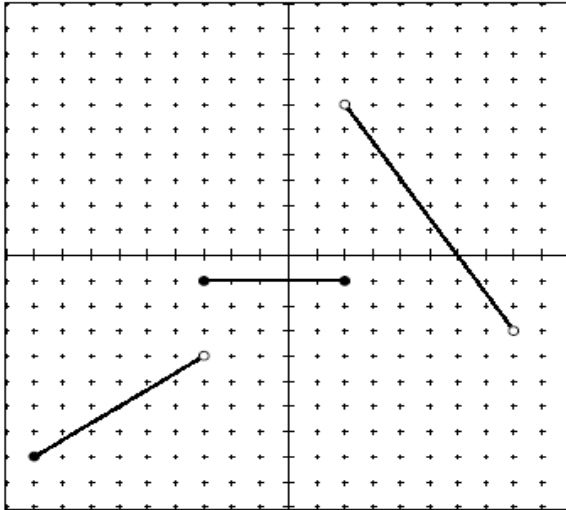
Domain _____

Range _____





39. Write the equation of the graph below. State the domain and range.



Domain _____

Range _____

$f(x) = \left\{ \right.$

VIII. Solving Equations

Directions - Solve each of the following.

40. $30x^4 - 40x^2 + 10 = 0$

41. $343x^3 + 64 = 0$

42. $(x-3)^{\frac{2}{3}} = 81$

43. $\sqrt{x+2} + 5 = -6$

44. $\sqrt{4x+3} = \sqrt{3x+4}$



IX. Function Notation

For the function $f(x) = x^2 - 4x + 1$, evaluate

45. $f(2)$

46. $f(-x)$

47. $f(x+2)$

48. $\frac{f(x+h) - f(x)}{h} \quad h \neq 0$

X. Circles

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

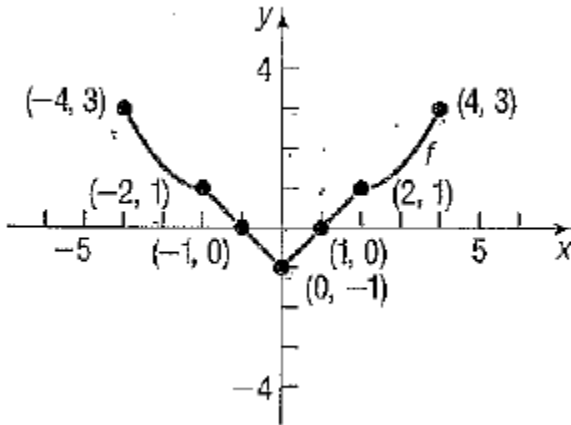
a. $x^2 + y^2 + 4x + 2y - 20 = 0$

b. $3(x+1)^2 + 3(y-1)^2 = 6$

50. Find the equation of the circle with endpoints of a diameter at (1, 4) and (-3, 2)



XII. For the graph of the function



51. Find the domain and range of the function
52. Find the intercepts
53. Is the graph symmetric with respect to the x-axis, the y-axis, or the origin?
54. Find $f(2)$
55. For what value(s) of x is $f(x) = 3$?
56. Solve $f(x) < 0$
57. Graph $y = f(x) + 2$
58. Graph $y = 2f(x)$
59. Is $f(x)$ even, odd, or neither?