To prepare our students to meet the scope and pace of next year’s Pre-calculus course, the Math Department recommends that students complete a review. The review refreshes Algebra 2 skills and assist in meeting the challenges of a variety of new topics presented in Pre-calculus. This is not required but is highly recommended.
Solve the equation.
1. \(-5(2x - 1) = 3(x + 4)\)  
   1. ___________

2. \(\frac{1}{3}(x - 6) = -\frac{2}{5}x + \frac{14}{15}\)  
   2. ___________

Solve the inequality. Use interval notation for solution set. Then graph your solution on a number line.
3. \(3x + 7 > 28\)  
   3. ___________

4. \(-6 \leq 2 - 3x \leq 11\)  
   4. ___________

5. \(|4 - 8x| \geq 100\)  
   5. ___________
6. \[ 6x + 4 < 22 \quad \text{or} \quad 5x - 8 \geq 32 \]

7. \[ |4a + 7| < 13 \]

Graph the following. Show all important details:

8. \[ f(x) = -|x| + 2 \]

9. \[ f(x) = |x - 2| - 3 \]

10. \[ f(x) = |1 - x| + 3 \]

11. \[ f(x) = \frac{1}{2}(x + 3)^2 \]
12. \( f(x) = -2(x-1)^2 + 4 \)

13. \( f(x) = 2(x-3)^3 - 2 \)

**Guidelines for Graphing Rational Functions**

1. **Removable Discontinuity (hole in the graph)**
   \( \rightarrow \) Occurs when \( p(x) \) and \( q(x) \) have a common factor

2. **Non-removable Discontinuity (Vertical Asymptote) (VA)**
   \( \rightarrow \) Occurs when the denominator equals zero

3. **Horizontal Asymptote (HA)**
   \( \rightarrow \) The value that the function approaches as \( x \) increases without bound
   a.) If the degree of the numerator < the degree of the denominator
      \( \rightarrow \) \( y = 0 \) is the horizontal asymptote
   b.) If the degree of the numerator = the degree of the denominator;
      \( \rightarrow \) \( y = \frac{\text{lead coefficient of the numerator}}{\text{lead coefficient of the denominator}} \) is the HA
   c.) If the degree of the numerator > the degree of the denominator
      \( \rightarrow \) There are NO horizontal asymptotes.

4. **X-Intercepts** \( \rightarrow \) zero(s) of the numerator

5. **y-Intercept** \( \rightarrow \) the value of \( f(0) \)

6. **Slant Asymptote**: \( \rightarrow \) Occurs when the degree of the numerator is exactly one more than the degree of the denominator. Example: \( f(x) = \frac{x^2-x}{x+1} \)

14. \( f(x) = \frac{2x^2-5x-12}{x^2-16} \)

15. \( f(x) = \frac{x+2}{x^2-4} \)

**Graph the following. Make sure you put all asymptotes, holes, intercepts on the graph provided. Go beyond a sketch!**
16. \[ f(x) = \frac{x + 2}{x + 3} \]

Determine the quotient by long division:
18. \[ (-2x^2 + 8x - 6) \div (x - 1) \]

19. \[ (x^2 - 16x + 49) \div (x - 8) \]

Graph:
20. \[ f(x) = \frac{x^3}{x^2 - 9} \]
21. **Evaluate and graph** the function for the given value of $x$.

\[ f(x) = \begin{cases} 
3x^2 + 2, & \text{if } x \leq -1 \\
-x + 4, & \text{if } x > -1 
\end{cases} \]

\[ f(-2) = \quad \]
\[ f(-1) = \quad \]
\[ f(0) = \quad \]

22. **Graph** the function.

\[ f(x) = \begin{cases} 
\frac{1}{2}x - 5, & \text{if } x < -2 \\
5x + 4, & \text{if } x \geq -2 
\end{cases} \]

23. **Factor** the trinomial. (Be sure to factor completely!)

\[ 3x^2 + 11x - 4 \]

24. \[ 9a^2 - 56a + 12 \]

25. \[ 4x^2 - 2x - 20 \]
Use square roots or factoring to solve each equation.

26. \( x^2 + 10x = -21 \)

27. \( 8y^2 + 5y = 2y^2 + 4 \)

28. \( 2x^2 - 13x - 7 = 0 \)

29. \( 2(n^2 - 20) + 17n = -10n^2 \)

30. \( -4(x + 2)^2 = -20 \)
31. \( \frac{1}{3}(x+2)^2 = \frac{3}{4} \)

32. \( x^2 - 4x + 8 = 0 \)

33. \( x^2 - 10x = 1 \)

34. \( 2x^2 - 5x = 7 \)

---

**Solve the equation by completing the square.** (You will be using this in class!)

<table>
<thead>
<tr>
<th>STEPS TO COMPLETING THE SQUARE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Take an equation in standard form: ( x^2 + bx + c )</td>
</tr>
<tr>
<td>2) Rewrite as: ( x^2 + bx = -c )</td>
</tr>
<tr>
<td>3) Add ( \left( \frac{b}{2} \right)^2 ) to both sides ( x^2 + bx + \left( \frac{b}{2} \right)^2 = -c + \left( \frac{b}{2} \right)^2 )</td>
</tr>
<tr>
<td>4) The left side is now a perfect square trinomial ( \left( x + \frac{b}{2} \right)^2 = -c + \left( \frac{b}{2} \right)^2 )</td>
</tr>
<tr>
<td>5) Now you can take the square root of both sides and solve for ( x ). (remember two roots + and -)</td>
</tr>
</tbody>
</table>

32. \( \frac{1}{3}(x+2)^2 = \frac{3}{4} \)

33. \( x^2 - 10x = 1 \)

34. \( 2x^2 - 5x = 7 \)
Use the quadratic formula to solve the equation. (Must use quadratic formula!)

35. \( 2x^2 + 3x - 8 = 0 \)

36. \( 4x^2 - 2x = 3 \)

Find the product of the polynomials.

37. \( (4x - 1)^2 \)

38. \( (x + 2)(2x^2 - 3x + 5) \)

39. \( (2x + 3)^3 \) This is a number cubed with a plus sign between! It does not equal \( 2x^3 + 3^3 \)
Factoring is an essential skill that you will need to master without the use of a calculator. Factor the polynomials completely.

40. $256x^5 - 81x^3$

41. $(x^3 + 27)$

42. $3x^5 + 6x^3 - 45x$

43. $x^3 + 5x^2 + 8x + 40$

44. $2x^3 + 18x^2 - 5x - 45$

Solve the equation. Check for extraneous solutions. (No calculator!)

45. $\sqrt{5x + 1} = x - 4$
46. $\sqrt{x+3} = \sqrt{2x-7}$

47. $x^{2/3} = 16$

48. $\sqrt[3]{x} + 4 = 2$

Perform the indicated operation. Simplify the result completely.

49. $\frac{20x^5}{y^2} \cdot \frac{x^2 y^2}{10x^3}$

50. $\frac{7x^2 - 14x}{x^3} \div \frac{5x - 10}{x^5}$

51. $\frac{x^2 - x - 20}{x + 4} \cdot \frac{x - 3}{x^2 - 2x - 15}$
52. \( \frac{8x - 1}{x^2 + x - 6} - \frac{4}{x - 2} \)

53. \( \frac{16}{m - 3} - \frac{4}{m - 4} \)

54. \( \frac{2x + 1}{x^2 - 4} + \frac{5}{x - 2} \)

55. \( \frac{-2}{x + 3} = \frac{1}{x + 1} \)

56. \( \frac{3}{x^2 - 9} = \frac{6}{x + 3} \)

\textbf{Solve} each equation.
Find the value of each variable. Write your answers in simplest radical form. Do not change any of the values to decimals. EXACT means leave it in a radical.

57. \[ \frac{3}{x^2 - 4} = \frac{2}{x + 2} + \frac{x}{x - 2} \]

58. _________________

59. _______________

60. _________________

61. _______________

62. _________________

63. _______________
64. Rationalize the denominator.  \( f(x) = \frac{7 - \sqrt{2}}{3 + \sqrt{2}} \)

65. Use the functions  \( f(x) = x^2 - 2 \) and  \( g(x) = \frac{1}{x} + 1 \)

a) \( f(x) + g(x) \)  
b) \( f(x) \cdot g(x) \)  
c) \( g(f(x)) \)

a) ________________  
b) ________________  
c) ________________

66. Find the domain of the following and use interval notation:

a) \( f(x) = \sqrt{3x + 2} \)  
b) \( f(x) = \frac{2x}{3x - 5} \)  
c) \( f(x) = \frac{x}{\sqrt{x + 5}} \)

a) ________________  
b) ________________  
c) ________________

d) \( f(x) = \frac{3x - 6}{x^2 - 25} \)  
e) \( g(x) = \frac{\sqrt{x + 3}}{x - 8} \)  
f) \( h(x) = \frac{3x + 15}{\sqrt{x - 6}} \)

d) ________________  
e) ________________  
f) ________________
67. Give intervals for which \( f(x) \) is:

Increasing _______________

Decreasing _______________

Constant _______________

(all in interval notation)

68. Give intervals for which \( f(x) \) is

Increasing _______________

Decreasing _______________

Constant _______________

(all in interval notation)

69. \( f(x) = 3 - 2x \), \( g(x) = \sqrt{x} \), and \( h(x) = 3x^2 + 2 \); Find the indicated value.

a) \((f + h)(5)\) 

b) \((g \circ f)(-2)\) 

c) \(h(x) \cdot g(x)\) 

d) \(h(x + 3)\) 

e) \(g(x) = \begin{cases} 
\frac{1}{2}x + 1, & x \leq 2 \\
-x - 2, & x > 2 
\end{cases} \). Find \( g(2) \)
70. **Perimeter** The altitude of an equilateral triangle is 12 centimeters. Find the perimeter of the triangle. Round to the nearest tenth.

71. **Area** The diagonal of a square is 12 inches. Find the area. Round to the nearest tenth.

72. **Bleachers** A fan at a sporting event is sitting at point A in the bleachers. The bleacher seating has an angle of elevation of 30° and a base length of 90 feet. Round to the nearest tenth.

   a) Find the height $CD$ of the bleachers. 
      
   b) Find the height of the fan sitting at point A from the ground. 
      
   c) Find the distance $AB$ that the fan is sitting from the base, point $B$. 
      
73. **Canyon** A symmetrical canyon is 4850 feet deep. A river runs through the canyon at its deepest point. The angle of depression from each side of the canyon to the river is 60°. Round to the nearest tenth.

   a) Find the distance across the canyon. 
      
   b) Find the length of the canyon wall from the edge to the river. 
      
   c) Is it more or less than a mile across the canyon? (5280 feet = 1 mile) 
      
\[ \text{Diagram:} \quad \triangle ABC \quad \text{with} \quad \angle C = 60°, \quad AB = 90 \text{ ft} \]

\[ \text{Diagram:} \quad \triangle ABC \quad \text{with} \quad \angle C = 60°, \quad AB = 4850 \text{ ft} \]