1. Solve for $w$.

\[ 5w^2 = -17w - 5 \]

2. Use the quadratic formula to solve for $x$.

\[ 2x^2 + 5x - 1 = 0 \]

3. Compute the value of the discriminant and give the number of real solutions of the quadratic equation.

\[ -5x^2 - x - 4 = 0 \]

Discriminant:

Number of real solutions:

4. Find all complex solutions of \[ 2x^2 - 3x + 5 = 0 \].
5. The length of a rectangle is 5 yards more than twice its width, and the area of the rectangle is 63 square yards. Find the dimensions of the rectangle.

6. Solve for $x$, where $x$ is a real number.

$$x - 3 = \sqrt{-5x + 39}$$

7. Solve for $w$.

$$\frac{5}{w - 1} = -9 + \frac{2}{w + 1}$$

8. Solve for $x$.

$$\frac{x + 7}{x + 4} = \frac{x - 3}{x + 1} + 1$$

9. Find all real number solutions.

$$x + 7 \sqrt{x} - 18 = 0$$

10. Solve the inequality for $u$.

$$-13 < 7 - 5u$$

Simplify your answer as much as possible.
11. Solve the inequality for $w$.

$$-\frac{3}{2}w - 2 < -9w + 6$$

Simplify your answer as much as possible.

12. Solve the compound inequality.

$$-12 \leq 4x + 4 < 16$$

Graph the solution on the number line.

[Number line diagram]

13. Tom is going to rent a truck for one day. There are two companies he can choose from, and they have the following prices.

   Company A charges $100 and allows unlimited mileage.
   Company B has an initial fee of $65 and charges an additional $0.70 for every mile driven.

For what mileages will Company A charge less than Company B?
Use $m$ for the number of miles driven, and solve your inequality for $m$.

14. Keith is going to rent a truck for one day. There are two companies he can choose from, and they have the following prices.

   Company A has no initial fee but charges 70 cents for every mile driven.
   Company B charges an initial fee of $60 and an additional 50 cents for every mile driven.

For what mileages will Company A charge more than Company B?
Use $m$ for the number of miles driven, and solve your inequality for $m$. 
15. Solve for $v$.

$$|5v - 9| = |5v + 4|$$

16. Graph the solution to the inequality on the number line.

$$|x - 2| > 6$$

![Number line graph]

17. Find the midpoint $M$ of the line segment joining the points $C = (-1, 2)$ and $D = (7, -6)$.
18. Calculate the distance between the points \( H = (-8, 2) \) and \( P = (-4, 8) \) in the Cartesian plane.

Write the exact answer in radical form.

19. Graph the circle.

\[(x + 5)^2 + (y - 3)^2 = 9\]
20. Graph the circle.

\[ x^2 + y^2 + 8x - 4y + 11 = 0 \]

21. Find an equation of the circle that has center \((-3, 5)\) and passes through \((3, 2)\).

22. Find an equation of the circle whose diameter has endpoints \((-1, 3)\) and \((-3, -1)\).
23. For each relation, decide whether or not it is a function.

**Relation 1**

```
<table>
<thead>
<tr>
<th>Domain</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>desk</td>
<td>b</td>
</tr>
<tr>
<td>paper</td>
<td></td>
</tr>
<tr>
<td>sun</td>
<td></td>
</tr>
<tr>
<td>rock</td>
<td></td>
</tr>
</tbody>
</table>
```

- Function
- Not a Function

**Relation 2**

```
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<th>Domain</th>
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</tr>
</thead>
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<td>c</td>
</tr>
<tr>
<td>star</td>
<td>s</td>
</tr>
<tr>
<td>pencil</td>
<td>d</td>
</tr>
<tr>
<td>pen</td>
<td></td>
</tr>
</tbody>
</table>
```

- Function
- Not a Function

**Relation 3**

```
| (-3,-3), (-3,-4), (-3,9), (-5,0) |
```

- Function
- Not a Function

**Relation 4**

```
| \{(k, q), (b, q), (g, k), (g, l)\} |
```

- Function
- Not a Function
24. For each graph below, state whether it represents a function.

Function?:
Yes  No

Function?:
Yes  No

Function?:
Yes  No
Function?:
Yes  No

Function?:
Yes  No

Function?:
Yes  No
25. The function \( g \) is defined by \( g(x) = \frac{3x - 4}{x + 5} \).

Find \( g(x + 5) \).

26. Suppose that the relation \( T \) is defined as follows.

\[ T = \{(9, -8), (0, 3), (-7, 4), (-7, -5)\} \]

Give the domain and range of \( T \).
Write your answers using set notation.

27. Find the domain of the function.

\[ f(x) = \sqrt{-x + 9} \]

Write your answer using interval notation.

28. The function \( h \) is defined below.

\[ h(x) = \frac{x^2 + 2x - 63}{x^2 - 64} \]

Find all values of \( x \) that are NOT in the domain of \( h \).
If there is more than one value, separate them with commas.

29. Find the domain of the function.

\[ f(x) = \frac{\sqrt{9 + x}}{8 + 2x} \]

Write your answer as an interval or union of intervals.
30. The graph of a function $f$ is shown below.
   Find a value of $x$ for which $f(x) = 4$ and find $f(-2)$.

31. The graph of a function is given below.
   Give all $y$-intercepts and $x$-intercepts shown.

   If there is more than one answer, separate them with commas.

   $y$-intercept(s):
   $x$-intercept(s):
32. The entire graph of the function \( h \) is shown in the figure below. Write the domain and range of \( h \) using interval notation.

![Graph of h]

33. The entire graph of the function \( g \) is shown in the figure below. Write the domain and range of \( g \) as intervals or unions of intervals.

![Graph of g]

34. Find the average rate of change of \( f(x) = -3x^2 + 9 \) from \( x = 2 \) to \( x = 7 \).

Simplify your answer as much as possible.

\[
\text{Average rate of change} = \frac{f(7) - f(2)}{7 - 2}
\]
35. Find the $x$-intercept and $y$-intercept of the line.

$$6x - 8y = -15$$

$x$-intercept: ______________

$y$-intercept: ______________

36. Find the slope of the line graphed below.

![Graph of a line with points at (-3, 2) and (1, 0)]

37. Find the slope of the line passing through the points $(-6, 6)$ and $(4, -7)$.

38. Find the slope of the line.

$$3x + 5y = 3$$

Write your answer in simplest form.
39. Write an equation of the line below.

40. A line passes through the point \((5, -4)\) and has a slope of \(2\). Write an equation for this line.

41. Find an equation for the line below.
42. Write equations for the horizontal and vertical lines passing through the point \((-8, 1)\).

horizontal line:

vertical line:

43. Pablo will rent a car for a day. The rental company offers two pricing options: Option A and Option B. For each pricing option, cost (in dollars) depends on miles driven, as shown below.

![Graph showing the cost in dollars depending on miles driven for Option A and Option B.]

a. If Pablo drives the rental car 75 miles, which option costs more? How much more does it cost than the other option?

b. For what number of miles driven do the two options cost the same? If Pablo drives less than this amount, which option costs less?
44. For each system of linear equations shown below, classify the system as "consistent dependent," "consistent independent," or "inconsistent." Then, answer the question about its solutions.

L1: \( y = \frac{-1}{2} x - 1 \)

L2: \( y = \frac{-1}{2} x - 2 \)

This system of equations is:
- consistent dependent - consistent independent - inconsistent

This means the system has:
- a unique solution: \( (\ , \) \) - no solution - infinitely many solutions

L1: \( y = x + 2 \)

L2: \( y = -x + 4 \)

This system of equations is:
- consistent dependent - consistent independent - inconsistent

This means the system has:
- a unique solution: \(-\) no solution \(-\) infinitely many solutions

\[
\begin{align*}
L1: &\quad y = -3x - 3 \\
L2: &\quad 3x + y = -3
\end{align*}
\]

This system of equations is:
- consistent dependent - consistent independent - inconsistent

This means the system has:
- a unique solution: \(-\) no solution \(-\) infinitely many solutions

45. Use substitution to solve the system.

\[
\begin{align*}
y &= 3x - 4 \\
4x + 3y &= 27
\end{align*}
\]

\[
\begin{align*}
x &= \, \\
y &= \, 
\end{align*}
\]
46. Solve the following system of equations.

\[ 7x - 2y = -9 \]
\[ 4x - 5y = -9 \]

47. Two systems of equations are given below.
For each system, choose the best description of its solution.
If applicable, give the solution.

\[ \begin{align*}
\begin{array}{ccc}
\text{x + 5y = 5} & \text{x + 5y = 5} \\
\text{-x - 5y = 5} & \text{-x - 5y = 5} \\
\end{array}
\end{align*} \]
- The system has no solution.
- The system has a unique solution: \((x, y) = (5, -5)\)
- The system has infinitely many solutions. They must satisfy the following equation: 
  \[ y = 0 \]

\[ \begin{align*}
\begin{array}{ccc}
\text{x + 3y = 3} & \text{x + 3y = 3} \\
\text{-x - 3y = -3} & \text{-x - 3y = -3} \\
\end{array}
\end{align*} \]
- The system has no solution.
- The system has a unique solution: \((x, y) = (0, 1)\)
- The system has infinitely many solutions. They must satisfy the following equation: 
  \[ y = 1 \]

48. The Nguyen family and the Green family each used their sprinklers last summer. The water output rate for the Nguyen family’s sprinkler was 40L per hour. The water output rate for the Green family’s sprinkler was 25L per hour. The families used their sprinklers for a combined total of 55 hours, resulting in a total water output of 1825L. How long was each sprinkler used?

Nguyen family’s sprinkler: 
Green family’s sprinkler:
49. A scientist has two solutions, which she has labeled Solution A and Solution B. Each contains salt. She knows that Solution A is 70% salt and Solution B is 95% salt. She wants to obtain 110 ounces of a mixture that is 90% salt. How many ounces of each solution should she use?

Solution A: 
Solution B: 

50. Hong bought a desktop computer and a laptop computer. Before finance charges, the laptop cost $400 less than the desktop. He paid for the computers using two different financing plans. For the desktop the interest rate was 7.5% per year, and for the laptop it was 8% per year. The total finance charges for one year were $371. How much did each computer cost before finance charges?

51. Laura’s final exam has true/false questions, worth 3 points each, and multiple choice questions, worth 4 points each. Let \( x \) be the number of true/false questions she gets correct, and let \( y \) be the number of multiple choice questions she gets correct.

She needs more than 85 points on the exam to get an A in the class. Using the values and variables given, write an inequality describing this.
52. Graph the inequality.

\[ 4x + 3y < -12 \]

53. Graph the inequality in the coordinate plane.

\[ x \geq -5 \]
54. Graph the inequality.

\[ y \leq -2x + 5 \]

55. Graph the solution to the following system of inequalities.

\[
\begin{align*}
  y &\leq 2x - 9 \\
  y &> -3x + 4
\end{align*}
\]
56. Dale will donate up to $500 to charity. The money will be divided between two charities: the City Youth Fund and the Educational Growth Foundation. Dale would like to donate at least $160 dollars to the Educational Growth Foundation. He would also like the amount donated to the Educational Growth Foundation to be at least twice the amount donated to the City Youth Fund. Let $x$ denote the amount of money (in dollars) donated to the City Youth Fund. Let $y$ denote the amount of money (in dollars) donated to the Educational Growth Foundation. Shade the region corresponding to all values of $x$ and $y$ that satisfy these requirements.
Midterm Exam Practice Problems #1 Answers for class College Algebra / MAC 1105 – F 2013

1. \(-\frac{2}{5}, -3\)

2. \(-\frac{5 + \sqrt{33}}{4}, \frac{-5 - \sqrt{33}}{4}\)

3. Discriminant = \(-79\)  
   Number of real solutions = 0

4. \(x = \frac{3}{4} + \frac{\sqrt{39}}{4}i, \frac{3}{4} - \frac{\sqrt{39}}{4}i\)

5. Length: 14 yd  
   Width: 4.5 yd

6. \(x = 6\)

7. \(w = \frac{1}{3}, \frac{2}{3}\)

8. \(x = 5, -3\)

9. \(x = 4\)

10. \(u < 4\)

11. \(w < \frac{16}{15}\)

12. 

13. \(m > 50\)

14. \(m > 300\)

15. \(v = \frac{1}{2}\)
17. \( M = (3, -2) \)

18. Distance: \( \sqrt{52} \)

19. \( (-5, 3) \)

20. \( \begin{align*} (x + 3)^2 + (y - 5)^2 &= 45 \\ (x + 2)^2 + (y - 1)^2 &= 5 \end{align*} \)
23. 

| Relation 1 |
|---|---|
| **Domain** | **Range** |
| desk | 8 |
| paper | |
| sun | |
| rock | |

- Function
- Not a Function

| Relation 2 |
|---|---|
| **Domain** | **Range** |
| cloud | c |
| star | s |
| pencil | d |
| pen | |

- Function
- Not a Function

| Relation 3 |
|---|---|
| (-3,-2), (-3,-4), (-3,0), (-5,0) |

- Function
- Not a Function

| Relation 4 |
|---|---|
| \{(k,k), (b,\gamma), (g,k), (g,\gamma)\} |

- Function
- Not a Function

24. 

<table>
<thead>
<tr>
<th>Function?</th>
<th>(\text{C Yes})</th>
<th>(\text{C No})</th>
<th>(\text{C Yes})</th>
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<tbody>
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</tbody>
</table>

25. 

\[ g(x + 5) = \frac{3x + 11}{x + 10} \]

26. 

**Domain** = \(\{9, \Omega, -7\}\)

**Range** = \(\{-8, \Omega, 4, -5\}\)

27. \((-\infty, 9]\)

28. \(x = 8, -8\)

29. \([-9, -4) \cup (-4, \infty)\)

30. A value of \(x\) for which \(f(x) = 4\): 0

\[ f(-2) = 2 \]

31. \(y\)-intercept(s): -2

\(x\)-intercept(s): -2, 4
32. domain = \([-2, 3]\)  
   range = \([-4, 4]\)

33. domain = \(\{1, 2\} \cup \[3, 5\]\)  
   range = \((-5, -2]\)

34. \(-27\)

35. 
   \(x\)-intercept: \(-\frac{5}{2}\)
   \(y\)-intercept: \(\frac{15}{8}\)

36. \(-\frac{1}{2}\)

37. \(-\frac{13}{10}\)

38. \(-\frac{3}{5}\)

39. \(y = -x\)

40. \(y = 2x - 14\)

41. \(y = \frac{3}{5}x + \frac{27}{5}\)

42. horizontal line: \(y = 1\)  
   vertical line: \(x = -8\)

43. 
   (a) If Pablo drives the rental car 75 miles, which option costs more?

      Option B

      How much more does it cost than the other option?
      $15

   (b) For what number of miles driven do the two options cost the same?

      150

      If Pablo drives less than this amount, which option costs less?
      Option A
44.
L1: \( y = \frac{-1}{2} x - 1 \)
L2: \( y = \frac{-1}{2} x - 2 \)

This system of equations is:
- inconsistent
This means the system has:
- no solution
L1: \( y = x + 2 \)
L2: \( y = -x + 4 \)

This system of equations is:
- consistent independent
This means the system has:
- a unique solution:
Solution: \((1, 3)\)
L1: \( y = -3x - 3 \)
L2: \( 3x + y = -3 \)
This system of equations is:
- consistent dependent
This means the system has:
- infinitely many solutions

45. \( x = 3 \)
   \( y = 5 \)

46. \( x = -1 \)
   \( y = 1 \)

<table>
<thead>
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<th>( x + 5y = 5 )</th>
<th>( -x - 5y = 5 )</th>
</tr>
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<tbody>
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<tr>
<td>The system has a unique solution:</td>
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<tr>
<td>((x, y) = (0, 1))</td>
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<td>They must satisfy the following equation:</td>
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<td>The system has a unique solution:</td>
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<td>((x, y) = (1, 1))</td>
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<tr>
<td>They must satisfy the following equation:</td>
<td></td>
</tr>
<tr>
<td>( y = )</td>
<td></td>
</tr>
</tbody>
</table>

48. Nguyen family's sprinkler: 30 hours
    Green family's sprinkler: 25 hours

49. Solution A: 22 ounces
    Solution B: 88 ounces
50. Desktop: $2600  
     Laptop: $2200  

51. $3x + 4y > 35$