Preface

Here are the solutions to the practice problems for my Calculus I notes. Some solutions will have more or less detail than other solutions. The level of detail in each solution will depend up on several issues. If the section is a review section, this mostly applies to problems in the first chapter, there will probably not be as much detail to the solutions given that the problems really should be review. As the difficulty level of the problems increases less detail will go into the basics of the solution under the assumption that if you’ve reached the level of working the harder problems then you will probably already understand the basics fairly well and won’t need all the explanation.

This document was written with presentation on the web in mind. On the web most solutions are broken down into steps and many of the steps have hints. Each hint on the web is given as a popup however in this document they are listed prior to each step. Also, on the web each step can be viewed individually by clicking on links while in this document they are all showing. Also, there are liable to be some formatting parts in this document intended for help in generating the web pages that haven’t been removed here. These issues may make the solutions a little difficult to follow at times, but they should still be readable.
**Absolute Value Inequalities**

1. Solve the following equation.

\[ |4t + 9| < 3 \]

**Step 1**
There really isn’t all that much to this problem. All we need to do is use the formula for “less than” inequalities we discussed in the notes for this section. Doing that gives,

\[-3 < 4t + 9 < 3 \]

**Step 2**
To get the solution all we need to do then is solve the double inequality from the previous step. Here is that work.

\[-3 < 4t + 9 < 3 \]
\[-12 < 4t < -6 \]
\[ -3 < t < -\frac{3}{2} \]

2. Solve the following equation.

\[ |6 - 5x| \leq 10 \]

**Step 1**
There really isn’t all that much to this problem. All we need to do is use the formula for “less than” inequalities we discussed in the notes for this section. Doing that gives,

\[-10 \leq 6 - 5x \leq 10 \]

**Step 2**
To get the solution all we need to do then is solve the double inequality from the previous step. Here is that work.

\[-10 \leq 6 - 5x \leq 10 \]
\[-16 \leq -5x \leq -4 \]
\[ \frac{16}{5} \geq x \geq -\frac{4}{5} \]

Remember that when dividing all parts of an inequality by a negative number (as we did here) we need to also switch the direction of the inequalities!
3. Solve the following equation.

\[ |12x + 1| \leq -9 \]

Solution

There is no solution to this inequality.

We know that absolute value will only give positive or zero answers and so this inequality is asking what values of \( x \) will give a value on the left side (after taking the absolute value of course) that is less than a - 9. In other words, any solution requires that the absolute value give a negative number and we know that can’t happen. Therefore, there are no solutions to this inequality. This kinds of thing happens occasionally so don’t get too excited about it when it does.

4. Solve the following equation.

\[ |2w - 1| < 1 \]

Step 1

There really isn’t all that much to this problem. All we need to do is use the formula for “less than” inequalities we discussed in the notes for this section. Doing that gives,

\[-1 < 2w - 1 < 1\]

Step 2

To get the solution all we need to do then is solve the double inequality from the previous step. Here is that work.

\[-1 < 2w - 1 < 1\]
\[0 < 2w < 2\]
\[0 < w < 1\]

5. Solve the following equation.

\[ |2z - 7| > 1 \]

Step 1

There really isn’t all that much to this problem. All we need to do is use the formula for “greater than” inequalities we discussed in the notes for this section. Doing that gives,

\[2z - 7 < -1 \quad \text{or} \quad 2z - 7 > 1\]

Step 2

To get the solution all we need to do then is solve the two inequalities from the previous step. Here is that work.
6. Solve the following equation.

\[ |10 - 3w| \geq 4 \]

Step 1
There really isn’t all that much to this problem. All we need to do is use the formula for “greater than” inequalities we discussed in the notes for this section. Doing that gives,

\[ 10 - 3w \leq -4 \quad \text{or} \quad 10 - 3w \geq 4 \]

Step 2
To get the solution all we need to do then is solve the two inequalities from the previous step. Here is that work.

\[ 10 - 3w \leq -4 \quad \text{or} \quad 10 - 3w \geq 4 \]
\[ -3w \leq -14 \quad \text{or} \quad -3w \geq -6 \]
\[ \frac{w \geq 14}{3} \quad \text{or} \quad w \leq 2 \]

Remember that when dividing all parts of an inequality by a negative number (as we did here) we need to also switch the direction of the inequalities!

7. Solve the following equation.

\[ |4 - 3z| > 7 \]

Step 1
There really isn’t all that much to this problem. All we need to do is use the formula for “greater than” inequalities we discussed in the notes for this section. Doing that gives,

\[ 4 - 3z < -7 \quad \text{or} \quad 4 - 3z > 7 \]

Step 2
To get the solution all we need to do then is solve the two inequalities from the previous step. Here is that work.
\[
\begin{align*}
4 - 3z &< -7 & \quad \text{or} & \quad 4 - 3z &> 7 \\
-3z &< -11 & \quad \text{or} & \quad -3z &> 3 \\
\frac{z}{3} &> 11 & \quad \text{or} & \quad z &< -1
\end{align*}
\]

Remember that when dividing all parts of an inequality by a negative number (as we did here) we need to also switch the direction of the inequalities!