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 upon 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.
Transformations

1. Use transformations to sketch the graph of the following function.

\[ f(x) = \sqrt{x} + 4 \]

Step 1
Let’s first identify the “base” function (i.e. the function we are transforming). In this case it looks like we are transforming \( g(x) = \sqrt{x} \).

Step 2
The function that have here looks like it can be written as,

\[ f(x) = \sqrt{x} + 4 = g(x) + 4 \]

Therefore we can see that the graph of \( f(x) \) is simply going to be the graph of \( g(x) \) shifted up by 4.

Step 3
Here is a sketch of both the base function (blue dashed curve) and the function we were asked to graph (red solid curve).

2. Use transformations to sketch the graph of the following function.

\[ f(x) = x^3 - 2 \]
Step 1
Let’s first identify the “base” function (i.e. the function we are transforming). In this case it looks like we are transforming \( g(x) = x^3 \).

Step 2
The function that have here looks like it can be written as,

\[
 f(x) = x^3 - 2 = g(x) - 2
\]

Therefore we can see that the graph of \( f(x) \) is simply going to be the graph of \( g(x) \) shifted down by 2.

Step 3
Here is a sketch of both the base function (blue dashed curve) and the function we were asked to graph (red solid curve).

3. Use transformations to sketch the graph of the following function.

\[
 f(x) = |x + 2|
\]

Step 1
Let’s first identify the “base” function (i.e. the function we are transforming). In this case it looks like we are transforming \( g(x) = |x| \).

Step 2
The function that have here looks like it can be written as,

\[
 f(x) = |x + 2| = g(x + 2)
\]
Therefore we can see that the graph of \( f(x) \) is simply going to be the graph of \( g(x) \) shifted left by 2.

Step 3
Here is a sketch of both the base function (blue dashed curve) and the function we were asked to graph (red solid curve).

4. Use transformations to sketch the graph of the following function.

\[
f(x) = (x - 5)^2
\]

Step 1
Let’s first identify the “base” function (i.e. the function we are transforming). In this case it looks like we are transforming \( g(x) = x^2 \).

Step 2
The function that have here looks like it can be written as,

\[
f(x) = (x - 5)^2 = g(x - 5)
\]

Therefore we can see that the graph of \( f(x) \) is simply going to be the graph of \( g(x) \) shifted right by 5.

Step 3
Here is a sketch of both the base function (blue dashed curve) and the function we were asked to graph (red solid curve).
5. Use transformations to sketch the graph of the following function.

\[ f(x) = -x^3 \]

**Step 1**
Let’s first identify the “base” function (i.e. the function we are transforming). In this case it looks like we are transforming \( g(x) = x^3 \).

**Step 2**
The function that we have here looks like it can be written as,

\[ f(x) = -x^3 = -g(x) \]

Therefore we can see that the graph of \( f(x) \) is simply going to be the graph of \( g(x) \) reflected about the \( x \)-axis.

**Step 3**
Here is a sketch of both the base function (blue dashed curve) and the function we were asked to graph (red solid curve).
6. Use transformations to sketch the graph of the following function.

\[ f(x) = \sqrt{x+4} - 3 \]

Step 1
Let’s first identify the “base” function (i.e. the function we are transforming). In this case it looks like we are transforming \( g(x) = \sqrt{x} \).

Step 2
The function that have here looks like it can be written as,

\[ f(x) = \sqrt{x+4} - 3 = g(x+4) - 3 \]

Therefore we can see that the graph of \( f(x) \) is simply going to be the graph of \( g(x) \) shifted left by 4 and down by 3.

Step 3
Here is a sketch of both the base function (blue dashed curve) and the function we were asked to graph (red solid curve).
7. Use transformations to sketch the graph of the following function.

\[ f(x) = |x - 7| + 2 \]

**Step 1**
Let’s first identify the “base” function (i.e. the function we are transforming). In this case it looks like we are transforming \( g(x) = |x| \).

**Step 2**
The function that have here looks like it can be written as,

\[ f(x) = |x - 7| + 2 = g(x - 7) + 2 \]

Therefore we can see that the graph of \( f(x) \) is simply going to be the graph of \( g(x) \) shifted right by 7 and up by 2.

**Step 3**
Here is a sketch of both the base function (blue dashed curve) and the function we were asked to graph (red solid curve).
$f(x) = |x - 7| + 2$

$g(x) = |x|$