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.
**Complex Numbers**

1. Perform the indicated operation and write your answer in standard form.

\[(4 - 5i)(12 + 11i)\]

**Hint:** You know how to do the operation with polynomials so you can do the operation here! Just recall that you need to be careful to deal with any \(i^2\) that might happen to show up in the process.

**Solution**

We know how to multiply two polynomials and so we also know how to multiply two complex numbers. All we need to do is “foil” the two complex numbers to get,

\[(4 - 5i)(12 + 11i) = 48 + 44i - 60i - 55i^2 = 48 - 16i - 55i^2\]

All we need to do to finish the problem is to recall that \(i^2 = -1\). Upon using this fact we can finish the problem.

\[(4 - 5i)(12 + 11i) = 48 - 16i - 55(-1) = \boxed{103 - 16i}\]

2. Perform the indicated operation and write your answer in standard form.

\[(-3 - i) - (6 - 7i)\]

**Hint:** You know how to do the operation with polynomials so you can do the operation here!

**Solution**

We know how to subtract two polynomials and so we also know how to subtract two complex numbers.

\[(-3 - i) - (6 - 7i) = -3 - i - 6 + 7i = \boxed{-9 + 6i}\]

3. Perform the indicated operation and write your answer in standard form.

\[(1 + 4i) - (-16 + 9i)\]

**Hint:** You know how to do the operation with polynomials so you can do the operation here!

**Solution**

We know how to subtract two polynomials and so we also know how to subtract two complex numbers.

\[(1 + 4i) - (-16 + 9i) = 1 + 4i + 16 - 9i = \boxed{17 - 5i}\]
4. Perform the indicated operation and write your answer in standard form.

\[ 8i(10 + 2i) \]

Hint: You know how to do the operation with polynomials so you can do the operation here! Just recall that you need to be careful to deal with any \( i^2 \) that might happen to show up in the process.

Solution

We know how to multiply two polynomials and so we also know how to multiply two complex numbers. All we need to do is distribute the \( 8i \) to get,

\[ 8i(10 + 2i) = 80i + 16i^2 \]

All we need to do to finish the problem is to recall that \( i^2 = -1 \). Upon using this fact we can finish the problem.

\[ 8i(10 + 2i) = 80i + 16(-1) = -16 + 80i \]

5. Perform the indicated operation and write your answer in standard form.

\[ (-3 - 9i)(1 + 10i) \]

Hint: You know how to do the operation with polynomials so you can do the operation here! Just recall that you need to be careful to deal with any \( i^2 \) that might happen to show up in the process.

Solution

We know how to multiply two polynomials and so we also know how to multiply two complex numbers. All we need to do is “foil” the two complex numbers to get,

\[ (-3 - 9i)(1 + 10i) = -3 - 30i - 9i - 90i^2 \]

All we need to do to finish the problem is to recall that \( i^2 = -1 \). Upon using this fact we can finish the problem.

\[ (-3 - 9i)(1 + 10i) = -3 - 30i - 9i - 90(-1) = 87 - 39i \]

6. Perform the indicated operation and write your answer in standard form.

\[ (2 + 7i)(8 + 3i) \]
College Algebra

Hint: You know how to do the operation with polynomials so you can do the operation here! Just recall that you need to be careful to deal with any $i^2$ that might happen to show up in the process.

Solution
We know how to multiply two polynomials and so we also know how to multiply two complex numbers. All we need to do is “foil” the two complex numbers to get,

$$(2 + 7i)(8 + 3i) = 16 + 6i + 56i + 21i^2$$

All we need to do to finish the problem is to recall that $i^2 = -1$. Upon using this fact we can finish the problem.

$$(2 + 7i)(8 + 3i) = 16 + 6i + 56i + 21(-1) = -5 + 62i$$

7. Perform the indicated operation and write your answer in standard form.

$$\frac{7 - i}{2 + 10i}$$

Hint: Recall that standard form does not allow any $i$’s in the denominator.

Step 1
Because standard form does not allow for $i$’s to be in the denominator we’ll need to multiply the numerator and denominator by the conjugate of the denominator, which is $2 - 10i$.

Step 2
Multiplying by the conjugate gives,

$$\frac{7 - i}{2 + 10i} \cdot \frac{2 - 10i}{2 - 10i} = \frac{(7 - i)(2 - 10i)}{(2 + 10i)(2 - 10i)}$$

Step 3
Now all we need to do is do the multiplication in the numerator and denominator and put the result in standard form.

$$\frac{7 - i}{2 + 10i} = \frac{14 - 72i + 10i^2}{4 - 100i^2} = \frac{4 - 72i}{104} = \frac{4}{104} - \frac{72}{104}i = \frac{1}{26} - \frac{9}{13}i$$

8. Perform the indicated operation and write your answer in standard form.

$$\frac{1 + 5i}{-3i}$$
Hint: Recall that standard form does not allow any $i$'s in the denominator.

Step 1
Because standard form does not allow for $i$’s to be in the denominator we’ll need to multiply the numerator and denominator by the conjugate of the denominator, which is $3i$.

Step 2
Multiplying by the conjugate gives,
\[
\frac{1 + 5i}{-3i} \cdot \frac{3i}{3i} = \frac{(1 + 5i)(3i)}{(-3i)(3i)}
\]

Step 3
Now all we need to do is do the multiplication in the numerator and denominator and put the result in standard form.
\[
\frac{1 + 5i}{-3i} = \frac{3i + 15i^2}{-9i^2} = \frac{-15 + 3i}{9} = -\frac{15}{9} + \frac{3}{9}i = -\frac{5}{3} + \frac{1}{3}i
\]

9. Perform the indicated operation and write your answer in standard form.
\[
\frac{6 + 7i}{8 - i}
\]

Hint: Recall that standard form does not allow any $i$'s in the denominator.

Step 1
Because standard form does not allow for $i$’s to be in the denominator we’ll need to multiply the numerator and denominator by the conjugate of the denominator, which is $8 + i$.

Step 2
Multiplying by the conjugate gives,
\[
\frac{6 + 7i}{8 - i} \cdot \frac{8 + i}{8 + i} = \frac{(6 + 7i)(8 + i)}{(8 - i)(8 + i)}
\]

Step 3
Now all we need to do is do the multiplication in the numerator and denominator and put the result in standard form.
\[
\frac{6 + 7i}{8 - i} = \frac{48 + 62i + 7i^2}{64 - i^2} = \frac{41 + 62i}{65} = \frac{41}{65} + \frac{62}{65}i
\]