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.
Polynomials

1. Perform the indicated operation and identify the degree of the result.

Add $4x^3 - 2x^2 + 1$ to $7x^2 + 12x$

Step 1
Here is the operation we’re being asked to perform.

$\left(4x^3 - 2x^2 + 1\right) + \left(7x^2 + 12x\right)$

Note that the parenthesis are only there to illustrate how each polynomial is being used in the indicated operation and are not needed (or used) in general.

Here’s the result of the operation.

$\left(4x^3 - 2x^2 + 1\right) + \left(7x^2 + 12x\right) = 4x^3 + 5x^2 + 12x + 1$

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is three.

2. Perform the indicated operation and identify the degree of the result.

Subtract $4z^6 - 3z^2 + 2z$ from $-10z^6 + 7z^2 - 8$

Step 1
Here is the operation we’re being asked to perform.

$-10z^6 + 7z^2 - 8 - \left(4z^6 - 3z^2 + 2z\right)$

Be careful with the order here! We are subtracting the first polynomial from the second and that implies the order we’ve got here. Also be careful with the parenthesis on the second polynomial. We are subtracting the whole polynomial and so we need to have the parenthesis to do that.

Here’s the result of the operation.

$-10z^6 + 7z^2 - 8 - \left(4z^6 - 3z^2 + 2z\right) = -10z^6 + 7z^2 - 8 - 4z^6 + 3z^2 - 2z = -14z^6 + 10z^2 - 2z - 8$

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is **six**.

3. Perform the indicated operation and identify the degree of the result.

Subtract \(-3x^2 + 7x + 8\) from \(x^4 + 7x^3 - 12x - 1\)

**Step 1**
Here is the operation we’re being asked to perform.

\[
x^4 + 7x^3 - 12x - 1 - (-3x^2 + 7x + 8)
\]

Be careful with the order here! We are subtracting the first polynomial from the second and that implies the order we’ve got here. Also be careful with the parenthesis on the second polynomial. We are subtracting the whole polynomial and so we need to have the parenthesis to do that.

Here’s the result of the operation.

\[
x^4 + 7x^3 - 12x - 1 - (-3x^2 + 7x + 8) = x^4 + 7x^3 - 12x - 1 + 3x^2 - 7x - 8 = x^4 + 7x^3 + 3x^2 - 19x - 9
\]

**Step 2**
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is **four**.

4. Perform the indicated operation and identify the degree of the result.

\[12y \left( 3y^4 - 7y^2 + 1 \right)\]

**Step 1**
All we need to do is multiply the \(12y\) through the second polynomial. Here is the result of doing that.

\[12y \left( 3y^4 - 7y^2 + 1 \right) = 36y^5 - 84y^3 + 12y\]

**Step 2**
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is **five**.

5. Perform the indicated operation and identify the degree of the result.
College Algebra

\[(3x+1)\left(2-9x^2\right)\]

Step 1
All we need to do is foil out the two polynomials. Here is the result of doing that.

\[(3x+1)\left(2-9x^2\right) = 2 + 6x - 9x^2 - 27x^3\]

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is three.

6. Perform the indicated operation and identify the degree of the result.

\[(w^2+2)(3w^2+w)\]

Step 1
All we need to do is foil out the two polynomials. Here is the result of doing that.

\[(w^2+2)(3w^2+w) = 3w^4 + w^3 + 6w^2 + 2w\]

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is four.

7. Perform the indicated operation and identify the degree of the result.

\[(4x^6-3x)(4x^6+3x)\]

Step 1
All we need to do is foil out the two polynomials. Here is the result of doing that.

\[(4x^6-3x)(4x^6+3x) = 16x^{12} - 9x^2\]

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is twelve.

8. Perform the indicated operation and identify the degree of the result.
Step 1
Remember that this is just another way of writing,

\[ 3(10 - 4y^3)^2 = 3(10 - 4y^3)(10 - 4y^3) \]

Now all we need to do is foil out the two polynomials. Here is the result of doing that.

\[ 3(10 - 4y^3)^2 = 3(10 - 4y^3)(10 - 4y^3) = 3(100 - 80y^3 + 16y^6) = 300 - 240y^3 + 48y^6 \]

Be careful with dealing with the three! Make sure you take care of the exponent first (i.e. make sure you multiply out the product first) before you multiply the three through the result.

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is six.

9. Perform the indicated operation and identify the degree of the result.

\[ (x^2 + x - 2)(3x^2 - 8x - 7) \]

Step 1
Remember that the foil method only works for binomials and these are both trinomials (i.e. they each have three terms).

So, all we need to do is multiply each term in the second polynomial by each term in the first polynomial. Here is the result of doing that.

\[ (x^2 + x - 2)(3x^2 - 8x - 7) = 3x^4 - 8x^3 - 7x^2 + 3x^3 - 8x^2 - 7x - 6x^2 + 16x + 14 \]

\[ = 3x^4 - 5x^3 - 21x^2 + 9x + 14 \]

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is four.

10. Perform the indicated operation and identify the degree of the result.

Subtract \( 3(x^2 + 1)^2 \) from \( 6x^3 - 9x^2 - 13x - 4 \)
Step 1
Here is the operation we’re being asked to perform.

\[ 6x^3 - 9x^2 - 13x - 4 - 3(x^2 + 1)^2 \]

Now, before we actually do the subtraction we need to actually multiply out the second term before we do the subtraction. Here are the results of all these operations.

\[
\begin{align*}
6x^3 - 9x^2 - 13x - 4 - 3(x^2 + 1)^2 &= 6x^3 - 9x^2 - 13x - 4 - 3(x^4 + 2x^2 + 1) \\
&= 6x^3 - 9x^2 - 13x - 4 - 3x^4 - 6x^2 - 3 \\
&= -3x^4 + 6x^3 - 15x^2 - 13x - 7
\end{align*}
\]

Step 2
Remember the degree of a polynomial is just the largest exponent in the polynomial and so the degree of the result of this operation is **four**.