|  |  |
| --- | --- |
| **Complex Numbers (7.8)** | **Math 098** |

Definition: The number *i*

*i* is the unique number for which  and 

We can now define the root  provided *a* is non-negative.

Warning: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Express in terms of *i*.

|  |  |  |
| --- | --- | --- |
| 1.
 | 1.
 | 1.
 |

|  |  |
| --- | --- |
| Definition: Imaginary numbersAn *imaginary number* is a number that can be written in the form , where *a* and *b* are real numbers and .Imaginary numbers have many real world applications in engineering and the physical sciences. Some applications include: [control theory](http://en.wikipedia.org/wiki/Complex_number#Control_theory), [improper integrals](http://en.wikipedia.org/wiki/Complex_number#Improper_integrals), [fluid dynamics](http://en.wikipedia.org/wiki/Complex_number#Fluid_dynamics), [dynamic equations](http://en.wikipedia.org/wiki/Complex_number#Dynamic_equations), [electromagnetism and electrical engineering](http://en.wikipedia.org/wiki/Complex_number#Electromagnetism_and_electrical_engineering), [signal analysis](http://en.wikipedia.org/wiki/Complex_number#Signal_analysis), [quantum mechanics](http://en.wikipedia.org/wiki/Complex_number#Quantum_mechanics), [relativity](http://en.wikipedia.org/wiki/Complex_number#Relativity), [geometry](http://en.wikipedia.org/wiki/Complex_number#Geometry), [fractals](http://en.wikipedia.org/wiki/Complex_number#Fractals), [algebraic number theory](http://en.wikipedia.org/wiki/Complex_number#Algebraic_number_theory), and [analytic number theory](http://en.wikipedia.org/wiki/Complex_number#Analytic_number_theory)Note: Imaginary numbers are sometimes called complex numbers. |  |

Add or subtract

|  |  |
| --- | --- |
| 1.
 | 1.
 |

Warning: 

Multiply and simplify. Write you answers in the standard  form

|  |  |
| --- | --- |
| 1.
 | 1.
 |
| 1.
 | 1.
 |
| 1.
 | 1.
 |

Definition: Conjugate of a complex number

The *conjugate* of a complex number  is  and the conjugate of  is .

Find and multiply by the conjugate

1. 

conjugate: \_\_\_\_\_\_\_\_\_\_\_ and the product:

1. 

conjugate: \_\_\_\_\_\_\_\_\_\_\_ and the product:

1. 

conjugate: \_\_\_\_\_\_\_\_\_\_\_ and the product:

Method: When dividing by complex numbers, we multiply by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a manner similar to how we

 rationalize the denominator.

Divide. Write your answers in the form 

|  |  |
| --- | --- |
| 1.
 |  |
| 1.
 |  |

Explore powers of *i*

|  |  |  |
| --- | --- | --- |
| = | = | Divide powers by \_\_\_\_\_\_\_\_\_\_ |
| = | = | Remainder | Result |
| = | = |  |  |
| = | = |

Simplify

|  |  |
| --- | --- |
| 1.
 | 1.
 |
| 1.
 | 1.
 |

You can also work with complex numbers on the graphing calculator …