

## 8.5 Complex Numbers

Imaginary unit  $\sqrt{-1} = i$   
also  $i^2 = -1$

Simplify the following using the imaginary number  $i$  when necessary.

a.  $\sqrt{-4}$

b.  $\sqrt{-50}$

c.  $-\sqrt{25}$

Complex number: A number written in the form  $a + bi$  where  $a$  is a real number and  $b$  is the imaginary part.

1

[Back to Table of Contents](#)

8.5-1

For each complex number, name the real part and the imaginary part.

a.  $7 + 2i$

b.  $-8i$

Add or subtract the following complex numbers.

a.  $(7 + 4i) + (6 + 5i)$

b.  $(2 - 8i) - (6 + 3i)$

[Back to Table of Contents](#)

8.5-2

[Back to Table of Contents](#)

8.5-3

Multiply the following complex numbers.

a.  $5(2 + 6i)$

c.  $(4 + 7i)(2 - 9i)$

b.  $3i(6 + 4i)$

[Back to Table of Contents](#) 8.5-4

Divide the following. Put all answers in the standard form of a complex number ( $a + bi$ ).

a.  $\frac{9 + 21i}{3}$

b.  $\frac{2 - 5i}{3 + 2i}$

c.  $\frac{8 + 5i}{3i}$

[Back to Table of Contents](#) 8.5-7

Complex conjugates  $a + bi$  and  $a - bi$  are conjugates of one another.

Multiply the following complex numbers by their conjugates.

a.  $3 + 5i$

b.  $4 - 6i$

c.  $-2i$

[Back to Table of Contents](#) 8.5-6

Solve the following equations. Give answers in the standard form of a complex number.

a.  $m^2 = -16$

b.  $x^2 + 3x = -20$

[Back to Table of Contents](#) 8.5-8

Solve the following equations. Give answers in the standard form of a complex number.

c.  $t^3 - 6t^2 + 10t = 0$

[Back to Table of Contents](#) 8.5-8

Find the domain of the following rational functions. Determine if the excluded values represent where a vertical asymptote appears in the graph.

a.  $f(x) = \frac{x-7}{x+12}$

[Back to Table of Contents](#) 7.1-6

## 7.1 Rational Functions

Rational functions are functions that are fractions made up of polynomials.

Try graphing  $f(x) = \frac{3x+1}{2x-6}$

What is the Domain?

What is the Range?

Find the domain of the following rational functions. Determine if the excluded values represent where a vertical asymptote appears in the graph.

b.  $g(x) = \frac{x+8}{x^2+6x-16}$

[Back to Table of Contents](#) 7.1-6

## 7.2 Simplifying Rational Expressions

To simplify rational expressions

1. Factor the numerator and denominator
2. Divide out any common factors
3. Leave in factored form

Simplify:

a.  $\frac{40x^3}{12x}$

b.  $\frac{(a+5)(a+7)}{(a-2)(a+5)}$

Simplify the following rational expressions.

a.  $\frac{h^2 + 6h - 16}{h^2 - 4h + 4}$

b.  $\frac{(a-2)+8}{(a-2)(a-5)}$

c.  $\frac{12x^2 - 19x - 21}{15x^3 + 25x^2 - 140x}$

13

[Back to Table of Contents](#)

7.2.2

Simplify the following rational expressions.

Special case – Sometimes we need to factor out a negative 1.

a.  $\frac{3(x-4)}{5(4-x)}$

[Back to Table of Contents](#)

7.2-3