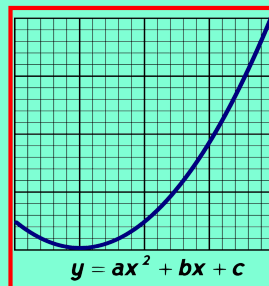


Math 125  
Fall 2021  
Lecture 34



Class QZ 28

Portrait  
style  
only

1) Simplify  $2\sqrt{24} - \sqrt{54}$   
 $= 2\sqrt{4}\sqrt{6} - \sqrt{9}\sqrt{6} = 2 \cdot 2\sqrt{6} - 3\sqrt{6}$   
 $= 4\sqrt{6} - 3\sqrt{6} = \sqrt{6} \checkmark$

2) Simplify  $2\sqrt{6}(\sqrt{6} - \sqrt{3})$   
 $= 2\sqrt{36} - 2\sqrt{18} = 2 \cdot 6 - 2\sqrt{9}\sqrt{2}$   
 $= 12 - 6\sqrt{2} \checkmark$

3) Simplify  $(\sqrt{5} + 2)(\sqrt{5} - 2)$   
 $= \sqrt{25} - \cancel{2\sqrt{5}} + \cancel{2\sqrt{5}} - 4 = 5 - 4$   
 $= 1 \checkmark$

Simplify, final answer in  $a+bi$  form.

1)  $\sqrt{75} - 2\sqrt{-12}$

$$= \sqrt{25} \sqrt{3} - 2\sqrt{4} \sqrt{3} \sqrt{-1} = \boxed{5\sqrt{3} - 4\sqrt{3}i}$$

Re. Part:  $5\sqrt{3}$

Im. Part:  $-4\sqrt{3}$

2)  $2(3-5i) - 5(1+3i)$

$$= 6 - 10i - 5 - 15i = \boxed{1 - 25i}$$

Re. Part = 1

Im. Part = -25

3)  $-2i(4+3i) + 3(2-i)$

$$= -8i - 6i^2 + 6 - 3i$$

$$= -8i - 6(-1) + 6 - 3i$$

$$= -8i + 6 + 6 - 3i = -11i + 12$$

$$= \boxed{12 - 11i}$$

Re. Part = 12

Im. Part = -11

Simplify:

1)  $(2-3i)(3-4i)$

$$= 6 - 8i - 9i + 12i^2 = 6 - 17i + 12(-1)$$

$$= 6 - 17i - 12 = \boxed{-6 - 17i}$$

2)  $(6+8i)(6-8i)$

$$= 36 - \cancel{48i} + \cancel{48i} - 64i^2 = 36 - 64(-1) = \boxed{100}$$

3)  $(-2+3i)^2 = (-2+3i)(-2+3i)$

$$= 4 - 6i - 6i + 9i^2$$

$$= 4 - 12i + 9(-1)$$

$$= 4 - 12i - 9 = \boxed{-5 - 12i}$$

Multiply the following by their complex conjugates, and simplify  $a+bi = a-bi$

$$1) (1 + 2i)(1 - 2i)$$

$$= 1 - \cancel{2i} + \cancel{2i} - 4i^2 = 1 - 4(-1) = \boxed{5}$$

$$2) (5 - 3i)(5 + 3i)$$

$$= 25 + \cancel{15i} - \cancel{15i} - 9i^2 = 25 - 9(-1) = \boxed{34}$$

$$3) (-8 - 6i)(-8 + 6i)$$

$$= 64 - \cancel{48i} + \cancel{48i} - 36i^2$$

$$= 64 - 36(-1) = \boxed{100}$$

Powers of  $i$ :

Even Powers  $i^{2n} = (i^2)^n = (-1)^n$

$$i^{100} = (i^2)^{50} = (-1)^{50} = 1$$

$$i^{70} = (i^2)^{35} = (-1)^{35} = -1$$

Odd Powers  $i^{2n+1} = i^{2n} \cdot i = (i^2)^n \cdot i$

$$i^{25} = i^{24} \cdot i = (i^2)^{12} \cdot i = (-1)^{12} \cdot i = 1 \cdot i = \boxed{i}$$

$$i^{35} = i^{34} \cdot i = (i^2)^{17} \cdot i = (-1)^{17} \cdot i = -1 \cdot i = \boxed{-i}$$

Simplify

$$1) i^{200} \xrightarrow{\text{even}} = (i^2)^{100} = (-1)^{100} = \boxed{1}$$

$$2) i^{55} \xrightarrow{\text{odd}} = i^{54} \cdot i = (i^2)^{27} \cdot i = (-1)^{27} \cdot i = -1 \cdot i = \boxed{-i}$$

$$3) i^{73} \xrightarrow{\text{odd}} = i^{72} \cdot i = (i^2)^{36} \cdot i = (-1)^{36} \cdot i = 1 \cdot i = \boxed{i}$$

How to divide by Complex number:

$$\frac{?}{a+bi} \cdot \frac{a-bi}{a-bi} = \text{Simplify}$$

Final Ans in  
Standard Form

Ex:

$$\begin{aligned} \frac{6}{1+3i} &= \frac{6(1-3i)}{(1+3i)(1-3i)} = \frac{6-18i}{1-\cancel{3i}+\cancel{3i}-9i^2} \\ &= \frac{6-18i}{1-9(-1)} = \frac{6-18i}{10} \\ &= \frac{6}{10} - \frac{18}{10}i \\ &= \boxed{\frac{3}{5} - \frac{9}{5}i} \end{aligned}$$

$$\begin{aligned}
 \frac{-2i}{3-2i} &= \frac{-2i(3+2i)}{(3-2i)(3+2i)} \\
 &= \frac{-6i - 4i^2}{9 + 6i - 6i - 4i^2} = \frac{-6i - 4(-1)}{9 - 4(-1)} \\
 &= \frac{4 - 6i}{13} = \boxed{\frac{4}{13} - \frac{6}{13}i}
 \end{aligned}$$

Divide

$$\begin{aligned}
 \frac{2+3i}{4-3i} &= \frac{(2+3i)(4+3i)}{(4-3i)(4+3i)} \\
 &= \frac{8 + 6i + 12i + 9i^2}{16 + \cancel{12i} - \cancel{12i} - 9i^2} \\
 &= \frac{8 + 18i + 9(-1)}{16 - 9(-1)} \\
 &= \frac{-1 + 18i}{25} = \boxed{\frac{-1}{25} + \frac{18}{25}i}
 \end{aligned}$$

Solve

$$\sqrt{2x-3} - 1 = 2$$

$$\sqrt{2x-3} = 3$$

square both sides

$$(\sqrt{2x-3})^2 = 3^2$$

$$\{ 6 \}$$

$$2x - 3 = 9$$

$$2x = 12$$

$$x = 6$$

check:

$$\sqrt{2(6)-3} - 1 = 2$$

$$\sqrt{12-3} - 1 = 2$$

$$\sqrt{9} - 1 = 2$$

$$3 - 1 = 2$$

$$2 = 2 \checkmark$$

Solve

$$\sqrt{2x+3} + 5 = 1$$

$$\sqrt{2x+3} = -4$$

$$(\sqrt{2x+3})^2 = (-4)^2$$

No Solution

$$\emptyset$$

6.5 is an  
extraneous solution.

$$2x + 3 = 16$$

$$2x = 13$$

$$x = \frac{13}{2} \quad x = 6.5$$

check

$$\sqrt{2(6.5)+3} + 5 = 1$$

$$\sqrt{13+3} + 5 = 1$$

$$\sqrt{16} + 5 = 1$$

$$4 + 5 = 1$$

$$9 = 1$$

False

Solve

$$x - \sqrt{7x+8} = 0$$

$$x = \sqrt{7x+8}$$

$$x^2 = (\sqrt{7x+8})^2$$

$$x^2 = 7x + 8$$

$$\{8\}$$

$$\text{E.S. } x = -1$$

$$\rightarrow x^2 - 7x - 8 = 0$$

$$(x-8)(x+1) = 0$$

$$x-8=0$$

$$x=8$$

$$x+1=0$$

$$x=-1$$

check  $x=8$ 

$$8 - \sqrt{7(8)+8} = 0$$

$$8 - \sqrt{64} = 0$$

$$8 - 8 = 0 \checkmark$$

check  $x=-1$ 

$$-1 - \sqrt{7(-1)+8} = 0$$

$$-1 - \sqrt{1} = 0$$

$$-1 - 1 = 0$$

$$-2 = 0$$

False

Solve

$$\sqrt[3]{2x-1} + 5 = 0$$

$$\sqrt[3]{2x-1} = -5$$

$$(\sqrt[3]{2x-1})^3 = (-5)^3$$

$$\rightarrow 2x - 1 = -125$$

$$2x = -124$$

$$x = -62$$

$$\text{check } x = -62 \checkmark$$

$$\{-62\}$$

Solve:

$$\sqrt[4]{2x-1} - \sqrt[4]{x+8} = 0$$

$$\sqrt[4]{2x-1} = \sqrt[4]{x+8}$$

Index = 4

Raise to 4th Power

$$\left(\sqrt[4]{2x-1}\right)^4 = \left(\sqrt[4]{x+8}\right)^4$$

$$2x-1 = x+8$$

$$\boxed{x=9} \checkmark \checkmark$$

Solve

$$x = \sqrt{x-3} + 3$$

$$x - 3 = \sqrt{x-3}$$

$$(x-3)^2 = (\sqrt{x-3})^2$$

$$(x-3)(x-3) = x-3$$

$$\{3, 4\}$$

$$\rightarrow x^2 - 3x - 3x + 9 = x - 3$$

$$x^2 - 6x + 9 - x + 3 = 0$$

$$x^2 - 7x + 12 = 0$$

$$(x-4)(x-3) = 0$$

$$x-4=0$$

$$\boxed{x=4} \checkmark$$

$$x-3=0$$

$$\boxed{x=3} \checkmark$$



Solve

$$x - \sqrt{x-4} = 4$$

$$x - 4 = \sqrt{x-4}$$

$$(x-4)^2 = (\sqrt{x-4})^2$$

$$(x-4)(x-4) = x-4$$

$$\rightarrow x^2 - 8x + 16 - x + 4 = 0$$

$$x^2 - 9x + 20 = 0$$

$$(x-5)(x-4) = 0$$

$$\begin{array}{cc} \emptyset & \emptyset \\ \boxed{x=5} \checkmark & \boxed{x=4} \checkmark \end{array}$$

$$\{4, 5\}$$

Class QZ 29

1) Simplify:  $(\sqrt{5} - \sqrt{2})^2$

$$\rightarrow \boxed{7 - 2\sqrt{10}}$$

$$= (\sqrt{5} - \sqrt{2})(\sqrt{5} - \sqrt{2}) = \sqrt{25} - \sqrt{10} - \sqrt{10} + \sqrt{4} = 5 - 2\sqrt{10} + 2 =$$

2) Solve & check:  $\sqrt{2x-1} - 2 = 5$

$$\sqrt{2x-1} = 5+2$$

$$\sqrt{2x-1} = 7$$

$$(\sqrt{2x-1})^2 = (7)^2$$

$$\rightarrow 2x-1 = 49$$

$$2x = 50$$

$$\boxed{x=25} \checkmark$$

check:

$$\sqrt{2(25)-1} - 2 = 5$$

$$\sqrt{49} - 2 = 5$$

$$7 - 2 = 5$$

$$5 = 5 \checkmark$$

$$\{25\}$$