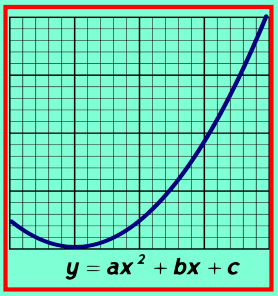
Math 125

Fall 2021

Lecture 33



Class QZ 27

$f(x) = \sqrt{6 - 2x}$

Find

$f(-15) = \sqrt{6-2(-15)} = \sqrt{6+30} = \sqrt{36} = 6$

$f(5) = \sqrt{6-2(5)} = \sqrt{6-10} = \sqrt{-4}$ undefined

Show work

Box Your Final Answer

Portrait style only

Complex Numbers:

$i = \sqrt{-1}$, $i^2 = -1$

$a + bi$ ← Standard Form

a: Real Part

b: Imaginary Part

$3 - 2i$

Real Part 3

Imaginary Part -2

$-5 + 4i$

Real Part -5

Imaginary Part 4

$-\frac{2}{3}i$

Real part 0

Im. Part $-\frac{2}{3}$

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write $\sqrt{50} - \sqrt{-36}$ in Complex Form.

$= \sqrt{25}\sqrt{2} - \sqrt{36}\sqrt{-1}$

$= 5\sqrt{2} - 6i$

Real Part $5\sqrt{2}$

Im. Part -6

$-\sqrt{121} + \sqrt{-75}$

$= -11 + \sqrt{25}\sqrt{3}\sqrt{-1}$

$= -11 + 5\sqrt{3}\,i$

Re. Part -11

Im. Part $5\sqrt{3}$

Operations with Complex numbers:

1) Simplify $3(2-4i)-2(1-7i)$

Distribute & Simplify

$= 6 - 12i - 2 + 14i$

$= \boxed{4 + 2i}$

Re. Part 4
Im. Part 2

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

Distribute & Simplify

Recall $\boxed{i^2 = -1}$

$= 10i - 6i^2 + 9 - 6i$

$= 10i - 6(-1) + 9 - 6i$

$= 10i + 6 + 9 - 6i$

$= 4i + 15 = \boxed{15 + 4i}$

Re. Part 15
Im. Part 4

Rewrite in Standard Form $a+bi$

Simplify $-3(-2+5i)+4i(-3-2i)$

Distribute and Simplify

$= 6 - 15i - 12i - 8i^2$

$= 6 - 27i - 8(-1) = 6 - 27i + 8$

$= \boxed{14 - 27i}$

Re. Part 14
Im. Part -27

Simplify

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

FOIL & Simplify

$= 5 - 3i + 10i - 6i^2$

$= 5 + 7i - 6(-1) = 5 + 7i + 6$

$= \boxed{11 + 7i}$

Re. Part 11
Im. Part 7

Simplify

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

FOIL & Simplify

$= -8 - 6i + 12i + 9i^2$

$= -8 + 6i + 9(-1) = -8 + 6i - 9$

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

Re. Part -17
Im. Part 6

It is common to use z for complex numbers

If $z = a+bi$, then $\bar{z} = a-bi$

$\bar{z}$ - bar

$\bar{z}$ is the complex conjugate of z.

$z = 2+3i$ $\quad \bar{z} = 2-3i$

$z = -4-5i$ $\quad \bar{z} = -4+5i$

$z = 8i$ $\quad \bar{z} = -8i$

Suppose $z = 3+4i$

1) $\bar{z} = \boxed{3-4i}$

2) $z \cdot \bar{z} = (3+4i)(3-4i)$

$= 9 - 12i + 12i - 16i^2$

$= 9 - 16(-1) = 9+16 = \boxed{25}$

3) $z^2 = (3+4i)^2 = (3+4i)(3+4i)$

$= 9 + 12i + 12i + 16i^2$

$= 9 + 24i + 16(-1)$

$= 9 + 24i - 16 = \boxed{-7+24i}$

Re. Part -7

Im. Part 24

Given $z = -2 - 3i$

1) $\bar{z} = \boxed{-2 + 3i}$

2) $z \cdot \bar{z} = (-2-3i)(-2+3i)$

$= 4 - 6i + 6i - 9i^2 = 4 - 9(-1)$

$= 4 + 9 = \boxed{13}$

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

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

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

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

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

Re. Part -5

Im. Part 12

Simplify:

$4\sqrt{18} - 6\sqrt{50}$

$= 4\sqrt{9}\sqrt{2} - 6\sqrt{25}\sqrt{2}$

$= 4 \cdot 3\sqrt{2} - 6 \cdot 5\sqrt{2}$

$= 12\sqrt{2} - 30\sqrt{2} = \boxed{-18\sqrt{2}}$

Simplify:

$3\sqrt{5}(2\sqrt{5} - \sqrt{10})$

$= 6\sqrt{25} - 3\sqrt{50}$

$= 6 \cdot 5 - 3\sqrt{25}\sqrt{2}$

$= 30 - 3 \cdot 5\sqrt{2} = \boxed{30 - 15\sqrt{2}}$

Simplify

$(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})$

$= \sqrt{9} - \sqrt{6} + \sqrt{6} - \sqrt{4} = 3 - 2 = \boxed{1}$

Simplify

$(\sqrt{6}+2\sqrt{2})(2\sqrt{6}-\sqrt{2})$

$= 2\sqrt{36} - \sqrt{12} + 4\sqrt{12} - 2\sqrt{4}$

$= 2 \cdot 6 + 3\sqrt{12} - 2 \cdot 2$

$= 12 + 3\sqrt{4}\sqrt{3} - 4$

$= 8 + 3 \cdot 2\sqrt{3} = \boxed{8 + 6\sqrt{3}}$

Solve

$\sqrt{3x+5} - 2 = 4$

isolate the radical

$\sqrt{3x+5} = 6$

Raise both sides to the index Power

index = 2

$(\sqrt{3x+5})^2 = (6)^2$

$3x + 5 = 36$

$3x = 31$

$\boxed{x = \frac{31}{3}}$ ✓

$\left\{\frac{31}{3}\right\}$

Check:

$\sqrt{3(\frac{31}{3})+5} - 2 = 4$

$\sqrt{31+5} - 2 = 4$

$\sqrt{36} - 2 = 4$

$6 - 2 = 4$

$4 = 4$ ✓

Solve $x - \sqrt{3x+4} = 0$

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

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

$x^2 = 3x + 4$

$x^2 - 3x - 4 = 0$

$(x-4)(x+1) = 0$

$x - 4 = 0$ $\quad$ $x + 1 = 0$

$\boxed{x = 4}$ $\quad$ $x = -1$ E.S.

$\{4\}$

Always isolate one radical

Raise both sides to the index Power

index = 2

Check $\boxed{x=4}$ ✓

$4 = \sqrt{3(4)+4}$

$= \sqrt{12+4}$

$= \sqrt{16}$

$= 4$ ✓

Check $\boxed{x=-1}$ E.S.

$-1 = \sqrt{3(-1)+4}$

$= \sqrt{-3+4}$

$= \sqrt{1}$

$= 1$ False

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

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

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

$(x+3)(x+3) = 2x-3$

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

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

$x^2 + 4x + 12 = 0$

$(x+6)(x-2) = 0$

Not Factorable

use other methods.

Just wait.

Always isolate one radical

Raise both sides to 2nd power

index = 2

Class QZ 28

Portrait style only

1) Simplify $2\sqrt{24} - \sqrt{54}$

$= 2\sqrt{4}\sqrt{6} - \sqrt{9}\sqrt{6} = 2 \cdot 2\sqrt{6} - 3\sqrt{6}$

$= 4\sqrt{6} - 3\sqrt{6} = \boxed{\sqrt{6}}$

2) Simplify $2\sqrt{6}(\sqrt{6} - \sqrt{3})$

$= 2\sqrt{36} - 2\sqrt{18} = 2 \cdot 6 - 2\sqrt{9}\sqrt{2}$

$= \boxed{12 - 6\sqrt{2}}$

3) Simplify $(\sqrt{5} + 2)(\sqrt{5} - 2)$

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

$= \boxed{1}$