4.1 Complex Numbers (Notes)

plify

NA'

Ex 1: $\sqrt{-27}$

$\sqrt{-1}\cdot\sqrt{27}$

$i\cdot\sqrt{9\cdot3}$

$3i\sqrt{3}$

$\sqrt{-216}$

$\sqrt{-1}\cdot\sqrt{216}$

$i\cdot\sqrt{36\cdot6}$

$6i\sqrt{6}$

Ex 2: $\sqrt{-18}$

$\sqrt{-1}\cdot\sqrt{18}$

$i\cdot\sqrt{9\cdot2}$

$3i\sqrt{2}$

$\sqrt{-125}$

$\sqrt{-1}\cdot\sqrt{125}$

$i\cdot\sqrt{25\cdot5}$

$5i\sqrt{5}$

Ex 3: $-5i\cdot3i$

$-15i^2$

$-15(-1)$

15

$\sqrt{-6}\cdot\sqrt{-15}$

$\sqrt{-1}\sqrt{3\cdot2}\cdot\sqrt{-1}\cdot\sqrt{3\cdot5}$

$\sqrt{-1}\cdot\sqrt{-1}\cdot\sqrt{3\cdot2\cdot3\cdot5}$

$i\cdot i\cdot3\sqrt{10}$

$3i^2\sqrt{10}$

$3(-1)\sqrt{10}$

$-3\sqrt{10}$

Ex 4: $3i\cdot4i$

$12i^2$

$12(-1)$

-12

$\sqrt{20}\cdot\sqrt{-12}$

$\sqrt{-1}\sqrt{20}\sqrt{1}\sqrt{12}$

$i\cdot i\sqrt{20}\cdot\sqrt{12}$

$i^2\sqrt{4\cdot5}\sqrt{4\cdot3}$

$-1\cdot4\sqrt{15}$

$-4\sqrt{15}$

i^{31}

$i\cdot i^{30}$

$i(i^2)^{15}$

$i(-1)^{15}$

$-1i$

inding Complex Numbers

Simplify

Ex 5: $\frac{4+i}{5i}\cdot\frac{5i}{5i}=\frac{20i+5i^2}{25i^2}=\frac{20i-5}{-25}=\frac{1}{5}-\frac{4}{5}i$

can't have an i in denominator

$\frac{4+i}{5i}\cdot\frac{i}{i}=\frac{4i+i^2}{5i^2}=\frac{4i-1}{-5}=\frac{1}{5}-\frac{4}{5}i$

Complex conjugates

$a+bi$ and $a-bi$ ⇒ Product is always a real number

Ex 6: $\frac{2i}{3+6i} \cdot \frac{3-6i}{3-6i} = \frac{6i-12i^2}{9-18i+18i-36i^2} = \frac{6i+12}{9+36} = \frac{12}{45} + \frac{6}{45}i$

$= \frac{4}{15} + \frac{2}{15}i$

Ex 7: $\frac{-2i}{3+5i} \cdot \frac{3-5i}{3-5i} = \frac{-6i+10i^2}{9-15i+15i+25i^2} = \frac{-6i-10}{9+25} = \frac{-10}{34} - \frac{6}{34}i$

$= \frac{-5}{17} - \frac{3}{17}i$

Ex 8: $\frac{2+i}{1-i} \cdot \frac{1+i}{1+i} = \frac{2+2i+i+i^2}{1+i-i-i^2} = \frac{2+3i-1}{1+1} = \frac{1+3i}{2} = \frac{1}{2} + \frac{3}{2}i$

Ex 9: