

Unit 5-4: Complex Numbers

Pg 216



$$\sqrt{3} \cdot \sqrt{3} = 3$$

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

$\sqrt{-1} = i$
$-1 = i^2$
$-i = i^3$
$i = i^4$

Ex#1:

a) $\sqrt{-27} = \sqrt{-1 \cdot 9 \cdot 3}$

$$3i\sqrt{3}$$

b) $\sqrt{-216}$

$$\sqrt{-216} = \sqrt{-1 \cdot 108 \cdot 2}$$

$$= \sqrt{-1 \cdot 54 \cdot 2 \cdot 2}$$

$$= 2 \cdot 3 \sqrt{-1 \cdot 6}$$

$$= 6i\sqrt{6}$$

1A) $\sqrt{-18} = \sqrt{-1 \cdot 9 \cdot 2}$

$$= 3i\sqrt{2}$$

1B) $\sqrt{-125} = \sqrt{-1 \cdot 25 \cdot 5}$

$$= 5i\sqrt{5}$$

EX#2a) $-5i \cdot 3i$

$$= -15i^2$$

$$= -15 \cdot -1$$

$$= 15$$

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

$$= \sqrt{1 \cdot 2 \cdot 3} \cdot \sqrt{-1 \cdot 3 \cdot 5}$$

$$= \sqrt{6} \cdot i\sqrt{15}$$

2A) $3i \cdot 4i$

$$= 12i^2$$

$$= 12 \cdot -1$$

$$= -12$$

$\sqrt{90} \cdot \sqrt{8} \cdot \sqrt{25}$

$$= 3i \cdot 2 \cdot \sqrt{10}$$

$$= 6i \cdot 2\sqrt{10}$$

$$= 12i\sqrt{10}$$

2B) $\sqrt{-20} \cdot \sqrt{-12}$

$$= \sqrt{-1 \cdot 4 \cdot 5} \cdot \sqrt{-1 \cdot 3 \cdot 4}$$

$$= 2i\sqrt{5} \cdot 2i\sqrt{3}$$

$$= 4i^2\sqrt{15}$$

$$= -4\sqrt{15}$$

2C) $\sqrt{-1} = i$

$$20 - 1 = 19$$

$$27 - 3 = 24$$

$$24 = 4 \cdot 6$$

Unit 5-4 = Complex Numbers

Pg 276



Ex#1:

a) $\sqrt{-27} = \sqrt{-1 \cdot 81} = 9i$

$3\sqrt{1 \cdot 3} = 3i\sqrt{3}$

b) $\sqrt{-216}$

$\sqrt{-216} = \sqrt{-1 \cdot 108} = \sqrt{-1 \cdot 36 \cdot 3} = 6i\sqrt{3}$

$$\begin{aligned} \sqrt{-1} &= i \\ -1 &= i^2 \\ -i &= i^3 \\ 1 &= i^4 \end{aligned}$$

1A) $\sqrt{-18} = \sqrt{-1 \cdot 9 \cdot 2} = 3i\sqrt{2}$

$\sqrt{-216} = \sqrt{-1 \cdot 27 \cdot 8} = 6i\sqrt{6}$

1B) $\sqrt{-125} = \sqrt{-1 \cdot 25 \cdot 5} = 5i\sqrt{5}$

EX#2a) $-5i - 3i = -8i$
 $-15i^2 = -15(-1) = 15$

b) $\sqrt{6} \cdot \sqrt{-15} = \sqrt{6 \cdot -15} = \sqrt{-90} = 3i\sqrt{10}$

2A) $3i - 4i = -i$
 $12i^2 = 12(-1) = -12$

$i^2 \sqrt{90} = i^2 \sqrt{9 \cdot 10} = 3i^2 \sqrt{10} = -3\sqrt{10}$

2B) $\sqrt{-20} \cdot \sqrt{-12} = \sqrt{-1 \cdot 4 \cdot 5} \cdot \sqrt{-1 \cdot 4 \cdot 3} = 2i\sqrt{5} \cdot 2i\sqrt{3} = 4i^2 \sqrt{15} = -4\sqrt{15}$

2C) $i^3 = -i$
 $i^5 = i$
 $i^9 = i$
 $i^{13} = -i$
 $i^{17} = -i$
 $i^{21} = i$
 $i^{25} = i$
 $i^{29} = -i$
 $i^{33} = -i$
 $i^{37} = i$
 $i^{41} = i$
 $i^{45} = -i$
 $i^{49} = -i$
 $i^{53} = i$
 $i^{57} = i$
 $i^{61} = -i$
 $i^{65} = -i$
 $i^{69} = i$
 $i^{73} = i$
 $i^{77} = -i$
 $i^{81} = -i$
 $i^{85} = i$
 $i^{89} = i$
 $i^{93} = -i$
 $i^{97} = -i$
 $i^{101} = i$
 $i^{105} = i$
 $i^{109} = -i$
 $i^{113} = -i$
 $i^{117} = i$
 $i^{121} = i$
 $i^{125} = -i$
 $i^{129} = -i$
 $i^{133} = i$
 $i^{137} = i$
 $i^{141} = -i$
 $i^{145} = -i$
 $i^{149} = i$
 $i^{153} = i$
 $i^{157} = -i$
 $i^{161} = -i$
 $i^{165} = i$
 $i^{169} = i$
 $i^{173} = -i$
 $i^{177} = -i$
 $i^{181} = i$
 $i^{185} = i$
 $i^{189} = -i$
 $i^{193} = -i$
 $i^{197} = i$
 $i^{201} = i$
 $i^{205} = -i$
 $i^{209} = -i$
 $i^{213} = i$
 $i^{217} = i$
 $i^{221} = -i$
 $i^{225} = -i$
 $i^{229} = i$
 $i^{233} = i$
 $i^{237} = -i$
 $i^{241} = -i$
 $i^{245} = i$
 $i^{249} = i$
 $i^{253} = -i$
 $i^{257} = -i$
 $i^{261} = i$
 $i^{265} = i$
 $i^{269} = -i$
 $i^{273} = -i$
 $i^{277} = i$
 $i^{281} = i$
 $i^{285} = -i$
 $i^{289} = -i$
 $i^{293} = i$
 $i^{297} = i$
 $i^{301} = -i$
 $i^{305} = -i$
 $i^{309} = i$
 $i^{313} = i$
 $i^{317} = -i$
 $i^{321} = -i$
 $i^{325} = i$
 $i^{329} = i$
 $i^{333} = -i$
 $i^{337} = -i$
 $i^{341} = i$
 $i^{345} = i$
 $i^{349} = -i$
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 $i^{365} = -i$
 $i^{369} = -i$
 $i^{373} = i$
 $i^{377} = i$
 $i^{381} = -i$
 $i^{385} = -i$
 $i^{389} = i$
 $i^{393} = i$
 $i^{397} = -i$
 $i^{401} = -i$
 $i^{405} = i$
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 $i^{613} = i$
 $i^{617} = i$
 $i^{621} = -i$
 $i^{625} = -i$
 $i^{629} = i$
 $i^{633} = i$
 $i^{637} = -i$
 $i^{641} = -i$
 $i^{645} = i$
 $i^{649} = i$
 $i^{653} = -i$
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 $i^{669} = -i$
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 $i^{725} = i$
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 $i^{733} = -i$
 $i^{737} = -i$
 $i^{741} = i$
 $i^{745} = i$
 $i^{749} = -i$
 $i^{753} = -i$
 $i^{757} = i$
 $i^{761} = i$
 $i^{765} = -i$
 $i^{769} = -i$
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 $i^{813} = -i$
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 $i^{829} = -i$
 $i^{833} = -i$
 $i^{837} = i$
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 $i^{853} = i$
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 $i^{861} = -i$
 $i^{865} = -i$
 $i^{869} = i$
 $i^{873} = i$
 $i^{877} = -i$
 $i^{881} = -i$
 $i^{885} = i$
 $i^{889} = i$
 $i^{893} = -i$
 $i^{897} = -i$
 $i^{901} = i$
 $i^{905} = i$
 $i^{909} = -i$
 $i^{913} = -i$
 $i^{917} = i$
 $i^{921} = i$
 $i^{925} = -i$
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 $i^{969} = i$
 $i^{973} = -i$
 $i^{977} = -i$
 $i^{981} = i$
 $i^{985} = i$
 $i^{989} = -i$
 $i^{993} = -i$
 $i^{997} = i$

$2i\sqrt{5} \cdot 2i\sqrt{3} = 4i^2 \sqrt{15} = -4\sqrt{15}$