Section 5-9: Complex #'s

Challenge: Solve $3x^2 + 15 = 0$

$$\begin{array}{r} 3x^2 + 15 = 0 \\ -15 \quad -15 \\ \hline \end{array}$$

$$\frac{\cancel{3}x^2}{\cancel{3}} = \frac{-15}{3}$$

$$\sqrt{x^2} = \sqrt{-5}$$

$$x = \sqrt{-5}$$

not a real root

Rene Descartes (Day-Cart)
Lived in the 1600's. He proposed the number i, where i is <u>not</u> a real number.

Definition $\boxed{i = \sqrt{-1}}$

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

$\boxed{i^3} = i^2 \cdot i = -1 \cdot i = \boxed{-i}$

$\boxed{i^4 = 1}$

$\sqrt{-1} = i$

practice

a.) $\sqrt{-12} = \sqrt{-1}\sqrt{12}$

$i \quad \sqrt{4}\sqrt{3}$

$2i\sqrt{3}$

i is "imaginary unit"

$2i$ is called a "pure imaginary number"

b.) $\sqrt{-27x^3}$

$\sqrt{-1}\sqrt{9}\sqrt{3}\sqrt{x^2}\sqrt{x}$

$i\,3x\sqrt{3x}$

$3ix\sqrt{3x}$

c.) $\sqrt{-81y^4} = \sqrt{-1}\sqrt{81}\sqrt{y^4}$

$= \boxed{9iy^2}$

Ex 2 p. 311

a.) $-3i \cdot 8i = -24i^2$ substitute

$= -24(-1) = \boxed{24}$

b.) $\sqrt{-6} \cdot \sqrt{-10} = i\sqrt{6} \cdot i\sqrt{10}$

$i^2\sqrt{60}$

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

$2i^2\sqrt{15}$

$2(-1)\sqrt{15}$

$\boxed{-2\sqrt{15}}$

c.) $i^{25} = i^{2(12)} \cdot i = (-1)^{12} \cdot i = 1 \cdot i = i$