35. $u^2 = -9u$

$u^2 + 9u = 0$

$u(u+9) = 0$

$\boxed{0, -9}$

37.

$14x - 49 = x^2$

$0 = x^2 - 14x + 49$

$0 = (x-7)^2$

$x = 7$, mult. of 2

49) $g(x) = x^2 - 8x$

$0 = x^2 - 8x$

$0 = x(x-8)$

$x = 0, 8$

27) $a^2 - 49 = 0$

$(a+7)(a-7) = 0$

$a = -7, 7$

$a^2 - b^2$

$(a-b)(a+b)$

49.) $0 = 12x^2 + 5x - 7$

$$\begin{array}{cc} 12 & 1 \\ -7 & 1 \end{array}$$

12, 7

$0 = (x+1)(12x - 7)$

$\boxed{-1, 7/12}$

$$\begin{array}{cc} 6 & 2 \\ 7 & 1 \end{array}$$

6, 14

$$\begin{array}{cc} 3 & 4 \\ 7 & 1 \end{array}$$

$12x - 7 = 0$

$+7 \quad +7$

$\frac{12x}{12} = \frac{7}{12}$

53. $2x^2 - 4x - 8 = -x^2 + x$

$$3x^2 - 5x - 8 = 0$$

$$(3x-8)(x+1) = 0$$

$3 \quad 1$

$-8 \quad 1$

$3, 8$

-8

$+3$

-5

$$\boxed{\frac{8}{3}, -1}$$

39.) $6r^2-7r-5=0$

$(2r+1)(3r-5)=0$

$\downarrow$

$-\frac{1}{2}, \frac{5}{3}$

2 3

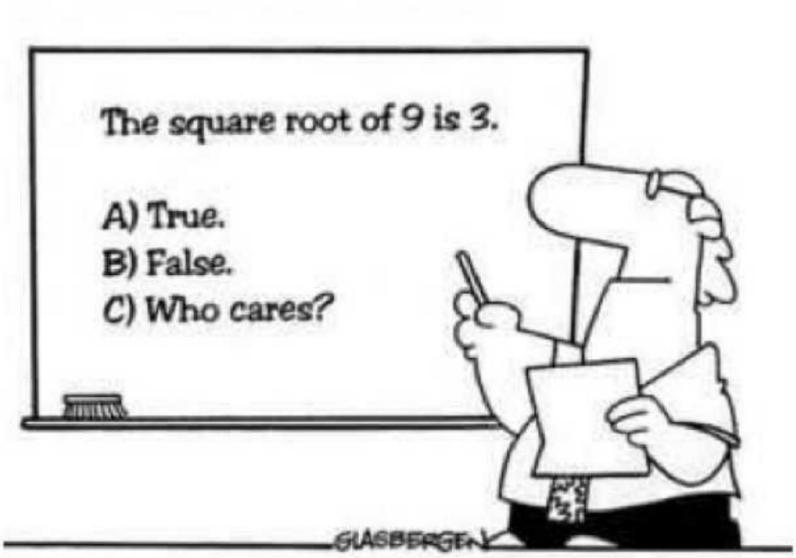
5 1

2 3

1 -5

Chapter 1a test: Average 79%

Square Root Review
1.6 Complex Numbers



Many students actually look forward to Mr. Atwadder's math tests.

*See printout.

Perfect Squares

$1^2 =$ _____	$7^2 =$ _____
$2^2 =$ _____	$8^2 =$ _____
$3^2 =$ _____	$9^2 =$ _____
$4^2 =$ _____	$10^2 =$ _____
$5^2 =$ _____	$11^2 =$ _____
$6^2 =$ _____	$12^2 =$ _____

Square Root Review

$\sqrt{r}$

radical

radicand

Square Root Properties

$\sqrt{16-9} \neq 4-3$

$\sqrt{7} \neq 1$

- Multiplication: $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$
- Division: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

*There are NO sum ($\sqrt{a+b}$) or difference ($\sqrt{a-b}$) properties!!!

Simplifying Radicals

$$\sqrt{r}$$

*A radical is fully simplified when...

- the radicand has NO perfect square factors other than 1
- there is NO radical in the denominator
- the radicand does NOT involve decimals
- the radicand is positive

ex: Simplify.

a) $\sqrt{12} = \sqrt{4} \cdot \sqrt{3} = 2\sqrt{3}$

$= \sqrt{4 \cdot 3}$

$\sqrt{48} = \sqrt{16} \cdot \sqrt{3}$

$= 4\sqrt{3}$

$\sqrt{48} = \sqrt{4} \cdot \sqrt{12}$

$2\sqrt{12}$

b) $\sqrt{27} = \sqrt{9} \cdot \sqrt{3} = 3\sqrt{3}$

c) $\sqrt{500} = \sqrt{100} \cdot \sqrt{5}$

$= 10\sqrt{5}$

d) $\sqrt{98} = \sqrt{49} \cdot \sqrt{2}$

$= 7\sqrt{2}$

e) $\sqrt{72} = \sqrt{36} \cdot \sqrt{2} = 6\sqrt{2}$

f) $\sqrt{\frac{9}{64}} = \frac{\sqrt{9}}{\sqrt{64}} = \frac{3}{8}$

$$\frac{{}^{1}\cancel{8}\sqrt{2}}{\cancel{16}\,2}$$

Rationalizing the denominator

g) $\sqrt{\frac{25}{2}} = \frac{5}{\sqrt{2}} \cdot \left(\frac{\sqrt{2}}{\sqrt{2}}\right) = \frac{5\sqrt{2}}{2}$

$\sqrt{37} \cdot \sqrt{37} = 37$

h) $\sqrt{\frac{13}{5}} = \frac{\sqrt{13}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{65}}{5}$

$(x-5)(x+5)$

$x^2 - 25$

Rationalize by multiplying by the conjugate of the denominator

i) $\frac{4}{(2-\sqrt{3})} \cdot \frac{(2+\sqrt{3})}{(2+\sqrt{3})} = \frac{8+4\sqrt{3}}{4+2\cancel{\sqrt{3}}-2\cancel{\sqrt{3}}-3}$

$= \boxed{8+4\sqrt{3}}$

F~~OI~~L

j) $\dfrac{2}{1+\sqrt{5}} \cdot \dfrac{(1-\sqrt{5})}{(1-\sqrt{5})} = \dfrac{\overset{1}{\cancel{2}}(1-\sqrt{5})}{-\cancel{4}\,2} = \dfrac{1-\sqrt{5}}{-2}$

$1-5$

FOIL $\quad -4$

$\dfrac{\overset{1}{\cancel{2}}-\overset{1}{\cancel{2}}\sqrt{5}}{-\cancel{4}\,-2}$

k) $\dfrac{\sqrt{2}}{\sqrt{3}-\sqrt{8}} \cdot \dfrac{(\sqrt{3}+\sqrt{8})}{(\sqrt{3}+\sqrt{8})} = \dfrac{\sqrt{6}+\sqrt{16}}{3-8} = \dfrac{\sqrt{6}+4}{-5}$

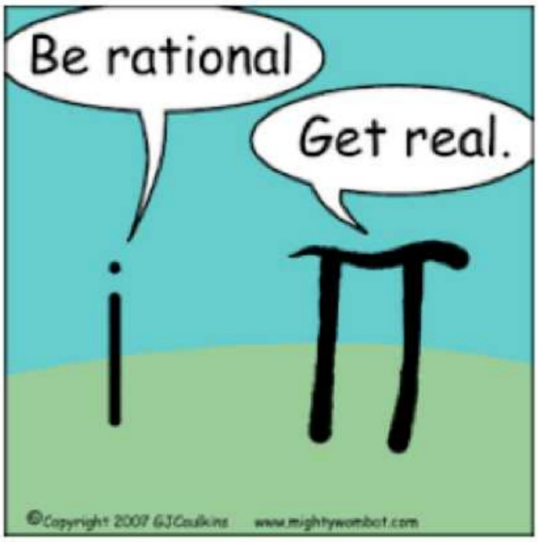
or

$\dfrac{-\sqrt{6}-4}{5}$

Imaginary Numbers

i

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



ex: Simplify.

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

$= i \cdot 3$

$= 3i$

b) $\sqrt{-18} = \sqrt{-1}\,\sqrt{18}$

$= i \cdot \sqrt{9} \cdot \sqrt{2}$

$= 3i\sqrt{2}$

c) $\sqrt{-32} = i\sqrt{32}$

$= 4i\sqrt{2}$

$\sqrt{-1} = i$

d) $2\sqrt{-45} = 2i\sqrt{45}$

$2i\underbrace{\cancel{\sqrt{9}}}_{3}\sqrt{5} = 6i\sqrt{5}$

Complex Numbers

Standard Form: $a + bi$

real imaginary

Examples of Complex Numbers:

$7 - 3i$

$8i$

$6 = 6 + 0i$

Real Part: 7 Imaginary Part: $-3i$

*EVERY NUMBER CAN BE EXPRESSED AS A COMPLEX NUMBER!

ex: Identify the real and imaginary parts.

a) $7-2i$ real: 7
imag: $-2i$

b) $4+3i$ real: 4
imag: $3i$

c) 7 real: 7
imag: 0

d) $6i\sqrt{5}$ real: 0

imag: $6i\sqrt{5}$

$a+bi$

$6\sqrt{5}\,i$

e) $\frac{i}{2}-3$ = $^{-}3+\frac{i}{2}$ real: -3

imag: $\frac{i}{2} = \frac{1}{2}i$

or

f) $\frac{18-i}{20}$ = $\frac{18}{20} - \frac{1i}{20}$ = $\frac{9}{10} - \frac{1}{20}i$ ☺

real: $\frac{9}{10}$

imag: $-\frac{1}{20}i$

ex: Simplify. State the answer in standard form.

a) $(3+6i)+(6-42i)$

$9-36i$

b) $(16-42i)-(3-64i)$

$16-42i-3+64i$

$13+22i$

c) $7(3-2i)$

$21-14i$

$\sqrt{-1}=i$

$i^2=-1$

d) $7i(3-2i)$

$21i-14i^2=21i+14=14+21i$

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

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

$3+i+10$

$13+i$

$i^2=-1$

f) $(6-3i)(6+3i) = 36+\cancel{18i}-\cancel{18i}-9i^2$

$36-9i^2$

$36+9$

45

g) $(1-2i)^2$

$(x+4)^2 \neq x^2+16$

$(x+4)(x+4)$

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

$1-2i-2i+4i^2$

$1-4i-4 = -3-4i$

h) $\frac{2}{3i} \cdot \frac{i}{i} = \frac{2i}{3i^2} = \frac{2i}{-3} \overset{\text{or}}{=} \frac{-2}{3}i$

i) $\dfrac{5}{2+i}$

j) $\frac{5+2i}{3-2i} \cdot \frac{3+2i}{3+2i} = \frac{15+10i+6i+4i^2}{9-4i^2}$

$= \frac{11+16i}{13}$

$= \frac{11}{13} + \frac{16}{13}i$

Powers of i

$i^2 \cdot i^1$

$i^2 \cdot i^2$

$i^4 \cdot i^2$

$i =$ <u>i</u>	$i^7 =$ <u>$-i$</u>
$i^2 =$ <u>-1</u>	$i^8 =$ <u>1</u>
$i^3 =$ <u>$-i$</u>	$i^9 =$ <u>i</u>
$i^4 =$ <u>1</u>	$i^{10} =$ <u>-1</u>
$i^5 =$ <u>i</u>	$i^{11} =$ <u>$-i$</u>
$i^6 =$ <u>-1</u>	$i^{12} =$ <u>1</u>

ex: Simplify. State the answer in standard form.

a) i^{3281}

$$\begin{array}{r|l} & 820 \text{ R}1 \\ 4 & 3281 \\ & \underline{32} \\ & 8 \\ & \underline{8} \\ & 1 \\ & \underline{-0} \\ & 1 \end{array}$$

$\boxed{i}$

b) i^{726}

$$\begin{array}{r|l} & 181 \text{ R}2 \\ 4 & 726 \\ & \underline{4} \\ & 32 \\ & \underline{32} \\ & 6 \\ & \underline{4} \\ & 2 \end{array}$$

$\boxed{-1}$

$i^1 = i$

$i^2 = -1$

$i^3 = -i$

$i^4 = 1$