14.1 Repeating Decimals as Fractions

$0.266\overline{6}$

$10x = 2.666\overline{6}$

$(-)\quad x = 0.266\overline{6}$

$9x = 2.4$

$x = \frac{2.4}{9}$

$x = \frac{24}{90} = \frac{4}{15}$

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14.2 Square Root of a number

$\sqrt{4} = 2$

$\sqrt{121} = 11$ because $11 \times 11 = 121$

what about $-11 \times -11 = 121$?

"the principal square root."

$\sqrt{81} = 9$

$-\sqrt{81} = -9$

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$\sqrt{x^2} \neq x$ $\quad \sqrt{x^2} = |x|$

$\sqrt{(-9)^2} \neq -9$

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14.3 Approximating Square Roots

ignore most of the stuff in the text and go by these notes.

1 4 9 16 25 36 49 64 81 100 121 144 169 196 225 256

① gross approx $\sqrt{30}$?

$\sqrt{25} = 5$

$\sqrt{36} = 6$

$\sqrt{30}$ $\quad \sqrt{64} = 8$ $\quad \sqrt{81} = 9$ $\quad 8.?$

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14.4 Simplifying Square Roots

$\sqrt{a}\sqrt{b} = \sqrt{ab}$

$\sqrt{3}\sqrt{7} = \sqrt{3 \cdot 7} = \sqrt{21}$

$\sqrt{4}\sqrt{9} = \sqrt{4 \cdot 9} = \sqrt{36} = 6$

$2 \cdot 3 = 6$

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$\sqrt{48} = \sqrt{4}\sqrt{12} = \sqrt{4}\sqrt{4}\sqrt{3}$

$2 \cdot 2\sqrt{3}$

$\sqrt{48} = 4\sqrt{3}$

$\sqrt{16} = 4$

$3\sqrt{60} = 3\sqrt{5}\sqrt{4}\sqrt{3}$

$= 3\sqrt{5}\, 2\sqrt{3}$

$= 6\sqrt{15}$

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$\sqrt{1} = 1$
$\sqrt{2} = 1.414\ldots$
$\sqrt{3} = 1.7\ldots$
$\sqrt{4} = 2$
$\sqrt{5} = 2.2\ldots$
$\sqrt{6} = 2.45\ldots$
$\sqrt{7} = 2.65\ldots$
$\sqrt{8} = 2.90\ldots$
$\sqrt{9} = 3$
$\sqrt{10} = 3.16\ldots$
$\sqrt{11} = 3.31\ldots$
$\sqrt{12} = \sqrt{4}\sqrt{3} = 3.4\ldots$
$\sqrt{13} = 3.61\ldots$
$\sqrt{14} = 3.74\ldots$
$\sqrt{15} = 3.87\ldots$
$\sqrt{16} = 4$

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14.5 Radicals with variables

$\sqrt{4x-8}$ real #?

$4x - 8 \geq 0$
$4x \geq 8$
$x \geq 2$

$\sqrt{12}$ real #? yes
$\sqrt{-3}$ real #? no

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$\sqrt{x^2} = x$
$\sqrt{x^3} = \sqrt{x^2 x} = \sqrt{x^2}\sqrt{x} = x\sqrt{x}$
$\sqrt{x^4} = \sqrt{x^2 x^2} = \sqrt{x^2}\sqrt{x^2} = x \cdot x = x^2$
$\sqrt{x^{10}} = \sqrt{x^5 x^5} = \sqrt{0 \cdot 0} = 0 = x^5$
$\sqrt{x^n} = x^{\frac{n}{2}}$
$\sqrt{x^7} = x^7$

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$\sqrt{a^8 b^{14}} = \sqrt{a^8}\sqrt{b^{14}} = a^4 b^7$

#18 pg401 $-\sqrt{16x^2y^{12}}$
$-\sqrt{16}\sqrt{x^2}\sqrt{y^{12}}$
$-4xy^6$

#17 pg401 $-\sqrt{4c^{12}d^6}$
$-\sqrt{4}\sqrt{c^{12}}\sqrt{d^6}$
$-2c^6d^3$

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14.6 Odd Powers of Variables

$\sqrt{x^5} = \sqrt{x^4 x} = \sqrt{x^4}\sqrt{x} = x^2\sqrt{x}$

ex3 $\sqrt{28xy^{11}} = \sqrt{4}\sqrt{7}\sqrt{x}\sqrt{y^{10}}\sqrt{y}$
$= 2\sqrt{7}\sqrt{x}\, y^5\sqrt{y}$
$= 2y^5\sqrt{7xy}$

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ex4 $-5x^3y\sqrt{18x^5y^6}$
$\sqrt{9}\sqrt{2}\sqrt{x^4}\sqrt{x}\sqrt{y^6}$
$3\sqrt{2}\,x^2\sqrt{x}\,y^3$
$(-5)(3)(x^3)(x^2)(y)(y^3)\sqrt{2}\sqrt{x}$
$-15x^5y^4\sqrt{2x}$

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#6 p403 $\sqrt{24a^{11}} = \sqrt{4}\sqrt{6}\sqrt{a^{10}}\sqrt{a}$

$2\sqrt{6}\,a^5\sqrt{a}$

$2a^5\sqrt{6a}$

22 p403

$3xy\sqrt{18x^3y^4}$

$\sqrt{9}\sqrt{2}\sqrt{x^2}\sqrt{x}\sqrt{y^4}$

$3xy^2\sqrt{2x}$

$9x^2y^3\sqrt{2x}$

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14.7 Adding and Subtracting Radicals

$3x+2y = ?$ can't add

$3\sqrt{2}+2\sqrt{5} = ?$ can't add

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

$2x-3x+4x = 3x$

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$2\sqrt{5}-3\sqrt{20}$

$2\sqrt{5}-3\sqrt{4}\sqrt{5}$

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

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

$-4\sqrt{5}$

$4\sqrt{27}-5\sqrt{12}+3\sqrt{75}$

$4\sqrt{9}\sqrt{3}-5\sqrt{4}\sqrt{3}+3\sqrt{25}\sqrt{3}$

$4\cdot 3\sqrt{3}-5\cdot 2\sqrt{3}+3\cdot 5\sqrt{3}$

$12\sqrt{3}-10\sqrt{3}+15\sqrt{3}$

$17\sqrt{3}$

#17 p405

$\sqrt{20}-2\sqrt{45}-9\sqrt{5}$

$\sqrt{4}\sqrt{5}-2\sqrt{9}\sqrt{5}-9\sqrt{5}$

$2\sqrt{5}-2\cdot 3\sqrt{5}-9\sqrt{5}$

$-13\sqrt{5}$

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14.8 Multiplying Radicals

$5\sqrt{7}\cdot 6\sqrt{2}$

$30\sqrt{14}$

$-8\sqrt{10x}\cdot 3\sqrt{2x}$

$-24\sqrt{20x^2}$

$-24\sqrt{4}\sqrt{5}\sqrt{x^2}$

$-24\,(2)\sqrt{5}\,(x)$

$-48x\sqrt{5}$

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$\sqrt{7}\,(\sqrt{5}+4\sqrt{7})$

$\sqrt{7}\sqrt{5}+\sqrt{7}\,4\sqrt{7}$

$\sqrt{35}+4\sqrt{49}$

$\sqrt{35}+4\cdot 7$

$\sqrt{35}+28$

$(6\sqrt{3}-2\sqrt{2})(4\sqrt{3}+5\sqrt{2})$

$24\sqrt{9}+30\sqrt{6}-8\sqrt{6}-10\sqrt{4}$

$24\cdot 3+22\sqrt{6}-10\cdot 2$

$72+22\sqrt{6}-20$

$52+22\sqrt{6}$

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$(2\sqrt{5}-3\sqrt{6})(2\sqrt{5}+3\sqrt{6})$

$(a-b)(a+b) = a^2-b^2$

$4\sqrt{25}+6\sqrt{30}-6\sqrt{30}-9\sqrt{36}$

$4\cdot 5-9\cdot 6$

$20-54$

-34

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23 p408

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

$3\sqrt{25}+2\sqrt{10}-3\sqrt{10}-2\sqrt{4}$

$3\cdot5-\sqrt{10}-2\cdot2$

$15-\sqrt{10}-4$

$11-\sqrt{10}$

#25 $(\sqrt{6}-\sqrt{5})(\sqrt{6}+\sqrt{5})$

$6+\sqrt{30}-\sqrt{30}-5$

$6-5$

1

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14.9 Dividing Radicals

$\frac{\sqrt{20}}{\sqrt{2}}=\sqrt{\frac{20}{2}}=\sqrt{10}$

$\frac{\sqrt{50x^5}}{\sqrt{2x^3}}=\sqrt{\frac{50x^5}{2x^3}}=\sqrt{25x^2}=5x$

rationalizing the denominator

$\frac{3}{\sqrt{18}}=\frac{3}{\sqrt{9}\sqrt{2}}=\frac{3}{3\sqrt{2}}=\frac{1}{\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right)=\frac{\sqrt{2}}{2}$

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$\sqrt{\frac{15}{24y^5}}=\sqrt{\frac{3\cdot5}{3\cdot8\,y^5}}=\sqrt{\frac{5}{8y^5}}$

$=\frac{\sqrt{5}}{\sqrt{4}\sqrt{2}\sqrt{y^4}\sqrt{y}}=\frac{\sqrt{5}}{2y^2\sqrt{2y}}\left(\frac{\sqrt{2y}}{\sqrt{2y}}\right)=\frac{\sqrt{10y}}{(2y^2)(2y)}$

rationalizing the denominator

$=\frac{\sqrt{10y}}{4y^3}$

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$\frac{12xy^3}{\sqrt{18xy^4}}=\frac{12xy^3}{\sqrt{9}\sqrt{2}\sqrt{x}\sqrt{y^4}}=\frac{12xy^3}{3\sqrt{2}\sqrt{x}y^2}$

$\frac{12xy^3}{3y^2\sqrt{2x}}=\frac{4\cdot3\cdot x\cdot y^2\cdot y}{3\cdot y^2\sqrt{2x}}=\frac{4xy}{\sqrt{2x}}\left(\frac{\sqrt{2x}}{\sqrt{2x}}\right)$

$=\frac{4xy\sqrt{2x}}{2x}$

$=2y\sqrt{2x}$

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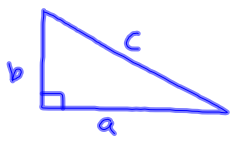
14.10 The Pythagorean Property



$a^2+b^2=c^2$

a, b are legs

c (across from right angle) is the hypotenuse

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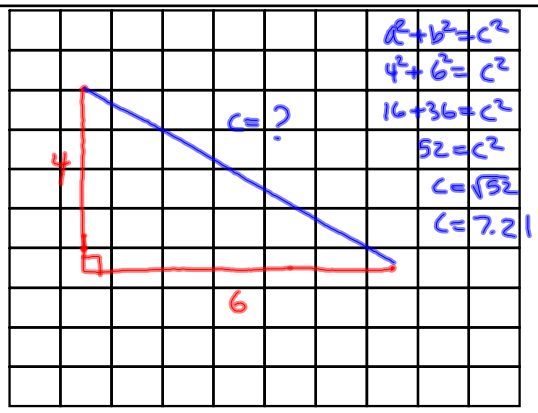

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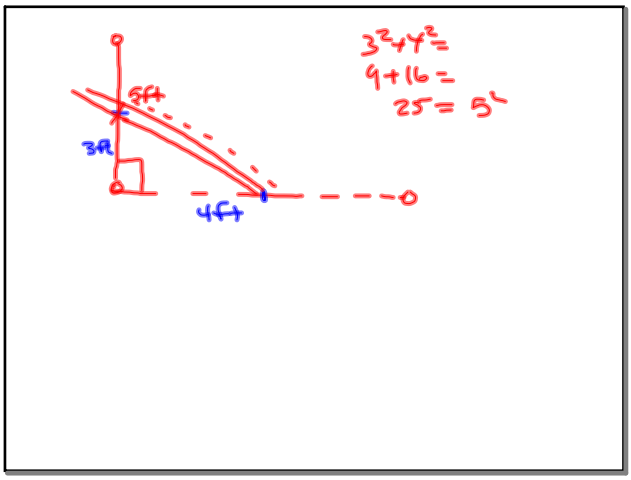

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14.11 Zero and Negative Exponents

$2^3=2\cdot2\cdot2=8$

$2^2=2\cdot2=4$

$2^1=2$

$2^0=1$ by definition

$\frac{2^7}{2^5}=2^{7-5}=2^2$

$\frac{2^3}{2^3}=2^{3-3}=2^0$

$0^1=0^2=0^n=0$

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$2^{-2}=\frac{1}{2^2}$

$\frac{2^5}{2^7}=2^{5-7}=2^{-2}$

$\frac{2\cdot2\cdot2\cdot2\cdot2}{2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2}=\frac{1}{2^2}$

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Homework:
page 422 #'s 13-17

Page 398 #13-25 odd

Page 422 #'s 18,20,22,23,26,27,31,33,35

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