Section 8.3: cont'd

Thursday, December 05, 2013
9:30 AM

Snow Day regulations:

if the college is closed, it is announced on the college webpage

(plus radio, newspaper; ...)

the announcement is usually made in the morning and is for the entire day

- check your email / course webpage if it's during exams

(your responsibility)

- who here lives over the Malahat? Sooke?

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solve: $(m+3)^2 + 5(m+3) - 14 = 0$

method #1: (substitution)

let $x = m+3$

$$x^2 + 5x - 14 = 0$$
$$(x+7)(x-2) = 0$$
$$x = -7, 2$$

$$m+3 = -7, 2$$

$$m = -10, -1 \qquad \{-10, -1\}$$

method #2:

$$(m+3)^2 + 5(m+3) - 14 = 0$$

$$m^2 + 6m + 9 + 5m + 15 - 14 = 0$$

$$m^2 + 11m + 10 = 0$$

$$(m+10)(m+1) = 0$$

$$m = -10, -1 \qquad \{-10, -1\}$$

solve: $(2x-1)^2 - 4(2x-1) + 2 = 0$

method #1: substitution

let $y = 2x - 1$

$y^2 - 4y + 2 = 0$ ← doesn't factor

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{4 \pm \sqrt{16 - 8}}{2}$$

$$= \frac{4 \pm \sqrt{8}}{2}$$

$$= \frac{4 \pm 2\sqrt{2}}{2}$$

$2x - 1 = y = 2 \pm \sqrt{2}$

$2x = 3 \pm \sqrt{2}$

$x = \frac{3 \pm \sqrt{2}}{2}$ $\left\{ \frac{3 \pm \sqrt{2}}{2} \right\}$

method #2:

$$(2x-1)^2 - 4(2x-1) + 2 = 0$$

$$4x^2 - 4x + 1 - 8x + 4 + 2 = 0$$

$$4x^2 - 12x + 7 = 0$$ ← doesn't factor!

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{12 \pm \sqrt{144 - 4 \cdot 4 \cdot 7}}{8}$$

$16 \cdot 7 = 112$

$$= \frac{12 \pm \sqrt{144 - 112}}{8}$$

$$= \frac{12 \pm \sqrt{32}}{8}$$

$$= \frac{12 \pm 4\sqrt{2}}{8}$$

$$= \frac{3 \pm \sqrt{2}}{2} \qquad \left\{ \frac{3 \pm \sqrt{2}}{2} \right\}$$

solve : (solutions may be complex)

$$m^4 - 5m^2 - 36 = 0$$

method #1 : substitution

let $x = m^2$
$x^2 = m^4$

$$x^2 - 5x - 36 = 0$$
$$(x - 9)(x + 4) = 0$$
$$x = -4, \; 9$$

so

square root both sides → $m^2 = -4$ or $m^2 = 9$

$m = \pm\sqrt{-4}$ $\qquad$ $m = \pm 3$

$= \pm\sqrt{4}\sqrt{-1}$

$= \pm 2i$

$\{\pm 3, \pm 2i\}$

note: the degree is 4 (m^4) so could have as many as 4 solutions
- can have fewer but 4 is max

It takes Brent one hour longer than Calvin to chop a load of wood. If together they chop the wood in 45 minutes, how long would it take each one of them working alone?

note: use the same units for time everywhere

	work =	rate	· time
Brent	1 =	$\frac{1}{x+1}$	$x+1$
		+	
Calvin	1 =	$\frac{1}{x}$	x
		=	
together	1 =	$4/3$	$3/4$

$3x(x+1)\left(\frac{1}{} + \frac{1}{}\right) = (4)\,3x(x+1)$

$$3x + 3(x+1) = 4x(x+1)$$

$$3x + 3x + 3 = 4x^2 + 4x$$

$$= 4x^2 - 2x - 3$$

Cannot be factored! →

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{2 \pm \sqrt{4 - 4 \cdot 4(-3)}}{2 \cdot 4}$$

$$= \frac{2 \pm \sqrt{4 + 48}}{8}$$

$$= \frac{2 \pm \sqrt{52}}{8}$$

$$= \frac{2 \pm \sqrt{4 \cdot 13}}{8}$$

$$= \frac{2 \pm 2\sqrt{13}}{8}$$

$$= \frac{1 \pm \sqrt{13}}{4}$$

$$= \frac{1 - \sqrt{13}}{4}, \quad \frac{1 + \sqrt{13}}{4}$$

how big (about) is $\sqrt{13}$?

$\sqrt{9}$ is 3

$\rightarrow \sqrt{13}$ will be a bit bigger than 3

$\sqrt{16}$ is 4

and $1 - \sqrt{13}$ will be negative

Calvin will take $\frac{1 + \sqrt{13}}{4}$ hours and

Brent will take $\frac{5 + \sqrt{13}}{4}$ hours.

$x = \frac{1 + \sqrt{13}}{4}$ $\leftarrow$ Calvin's time

$x + 1 = \frac{1 + \sqrt{13}}{4} + 1$

$= \frac{1 + \sqrt{13}}{4} + \frac{4}{4} = \frac{5 + \sqrt{13}}{4}$