Day 64

6.4 Review

Solve. $64x^3 + 8 = 0$

$(4x + 2)(16x^2 - 8x + 4) = 0$

$\sqrt[3]{64x^3} = 4x$; $\sqrt[3]{8} = 2$; $(4x)^2$; $(4x)(2)$; 2^2

$4x + 2 = 0$

$-2 \quad -2$

$\frac{4x}{4} = \frac{-2}{4}$

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

$16x^2 - 8x + 4 = 0$ (A, B, C)

quadratic formula.

$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(16)(4)}}{2(16)}$

$x = \frac{8 \pm \sqrt{-192}}{32}$; $64 = 3$

$x = \frac{8 \pm 8i\sqrt{3}}{32}$

$x = \frac{1 \pm i\sqrt{3}}{4}$

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

(ex2) $125x^3 + 216 = 0$

$(5x + 6)(25x^2 - 30x + 36) = 0$

$5x + 6 = 0$

$-6 \quad -6$

$\frac{5x}{5} = \frac{-6}{5}$

$x = -\frac{6}{5}$

quadratic formula

$x = \frac{-(-30) \pm \sqrt{(-30)^2 - 4(25)(36)}}{2(25)}$

$x = \frac{30 \pm \sqrt{-2700}}{50}$; $900 = 3$; 100 ; 27 ; $9 \cdot 3$

$x = \frac{30 \pm 30i\sqrt{3}}{50} = \frac{3 \pm 3i\sqrt{3}}{5}$

(ex) Solve. $x^4 + 8x^2 + 15 = 0$

$(x^2+5)(x^2+3) = 0$

$x^2+5=0$ $\quad$ $x^2+3=0$

$-5\ -5$ $\quad$ $-3\ -3$

$\sqrt{x^2} = \sqrt{-5}$ $\quad$ $\sqrt{x^2} = \sqrt{-3}$

$x = \pm i\sqrt{5}$ $\quad$ $x = \pm i\sqrt{3}$

6.5 Polynomial Theorems for Roots

(1) Rational Roots (decimals that end or repeat)

1st: List the possible rational roots:

$$= \pm \frac{\text{Factors of constant}}{\text{Factors of the leading coefficient}}$$

2nd: Look at the graph to see if any of these look like roots, verify with the table.

3rd: you can use factoring and synthetic ÷ to find other roots that may be irrational or imaginary.

ex 1 $f(x) = 2x^3 + x^2 + 2x + 1$

L.C. ↑ 2 ; ↖ constant 1

list: $\frac{\pm 1}{1, 2} = \pm 1, \pm \frac{1}{2}$ possible rational roots

(like 1-6)

$X = -1/2$ rational

7-11 Find the roots.

$-\frac{1}{2}$ | 2 1 2 1
↓ -1 0 -1
2 0 2 | 0

$2x^2 + 2 = 0$
$-2 \quad -2$
$\frac{2}{2}x^2 = -\frac{2}{2}$
$\sqrt{x^2} = \sqrt{-1}$
$x = \pm 1i$

Find all roots: $-\frac{1}{2}, 1i, -1i$

ex 2 $3x^3 + x^2 - 15x - 5 = 0$

possibles: $\pm \frac{1, 5}{1, 3}$

$\pm 1, \pm \frac{1}{3}, \pm 5, \pm 5/3$

$X = -1/3$ rational

Find all roots

$$\begin{array}{r|rrrr} -\frac{1}{3} & 3 & 1 & -15 & -5 \\ & & -1 & 0 & 5 \\ \hline & 3 & 0 & -15 & 0 \end{array}$$

$3x^2 - 15 = 0$

$+15 \quad +15$

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

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

$x = \pm\sqrt{5}$

all roots

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

p. 331 (44-54 even) *like today's warm-ups

p. 339 (1-11, 25-28)

(7-11) all roots