Review 1.20.2018

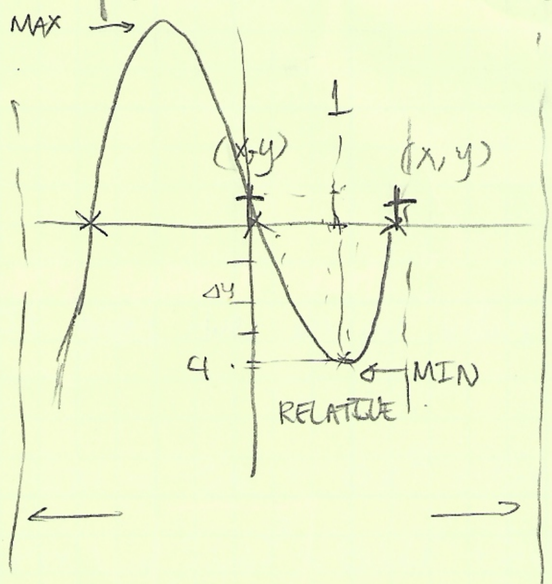
QUIZ

$a \cdot a = a^2$

$2 \cdot (2 \times 3)$
$2 \times 3 + 2 \times 3$

(1)

I: Graph $P(x) = x^3 + 2x^2 - 7x$



$a \cdot b = b \cdot a$ $\quad 2 \times 3 = 3 \times 2$

BASIC OPERATIONS

(REL) MAX & MIN

MIN $= \begin{cases} x = 1 \\ y = 4 \end{cases}$

Remember.
♡ Pascal's Triangle ?

FACTORS...

INV. DIST $= (2x + 4y)$

DISTR $2 \cdot (x + 2y)$

START

II) Factors (DISTRIBUTIVE)

★ A) BINOMIAL THEOREM

$(a + b)$
TERMS

II) $(a+b)^2 = (a+b) \cdot (a+b)$

$(a+b)^2 = a^2 + \underbrace{a \cdot b + b \cdot a} + b^2$ ♡

III) $(a^2 + b^2) = \boxed{a^2 + 2ab + b^2}$ $(a^2 + b^2)$

(I)
$(a+b)^0 = 1$
$(a+b)^1 = (a+b)$
$(a+b)^2 = (a+b) \cdot (a+b)$
$2 \cdot 2 = 2^2$
$(a+b) = 2$

(Recognize Pattern... ^{3} ^{3})

$(a^3 + b^3) = (1000x^3 + 216)$

$(10x)^3 + 6^3 = 10\,x \quad 6$ (3)(3) (3)

a b

$10 \cdot 10 = 10^2 = 100$
$100 \times 10 = 10^2 \cdot 10 = 10^3 = 1000$

(IV)
$\underline{a^3 + b^3} = \boxed{(a+b) \cdot (a^2 - ab + b^2)}$
$= a^3 + \cancel{(-a^2 \cdot b)} + \cancel{(a \cdot b^2)}$
$\cancel{+ba^2} + (-ab^2) + b^3$

Factors

$2^3 = 8$ $\quad$ $6^3 = 216$
$3^3 = 27$
$4^3 = 64$
$5^3 = 125$

DEVELOP $((10x)^3 + 6^3) = a^3 + b^3$
$= (10x + 6)\{(10x)^2 - 10x \cdot 6 + 6^2\}$ ✓

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DIVISION — Long Division — Synthetic.

$$\frac{V(X)}{h.A(X)} = \frac{A}{B.C} = 1 \qquad \frac{P(X)}{(x-5)}$$

Possible Rational Roots?	Rational?	Im.	complex Root?
It gives clues on pot. values	4/3	i	$4/3 + i$

$P(x) = 3x^3 + 8x^2 + 5x + 10$

$P(x) = \boxed{3.(2)^3} + \underbrace{8.(2)^2}\ + \underbrace{5.(2)} + \boxed{10}$ $\quad x = 2$

Q — P

$= 24 + 32 + 10 + 10$

p = smallest = Konstant =

q = largest = HIGHEST (0) "Leading coeff"

$q = \frac{\cancel{coeff}\ P}{Q} =$

$P = \pm 1, 2, 5, 10 \quad Q = \pm 1, 3$

$(\pm)(P)$ / (Q)	1	2	5	10
1	$\frac{1}{1}$	$\frac{2}{1}$	$\frac{5}{1}$	$\frac{10}{1}$
3	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{5}{3}$	$\frac{10}{3}$

→ 5.

7) $(x-(-6)).(x-(3/4)) = x^2 + 6x + 6x - 18x$

$(x+6).(x-3/4)$

$\left[x^2 + 6x + 6x - \frac{18}{4}\right] \times 4 = 4x^2 + 4.(12)x - \frac{\cancel{4}.18}{\cancel{4}}$

STAND. FORM $= 4x^2 + 48x - 18$

w/ all integer coeff

Ex: From Book
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Q. Solve $P(x^3)$ for all roots: (3)

$y = (a)x + \underbrace{b}_{\text{CONSTANT}}$ $\qquad P(x) = y = a_n \cdot x^n + a_{n-1} \cdot x^{n-1} \cdots + b$

Q.

Ex: $P(x) = \underbrace{15}_{Q} \cdot x^3 - 32x^2 + 3x + \underbrace{2}_{P} = 0$

METHOD:

I) APPLY RATIONAL ROOT THEOREM

P = CONSTANT $\qquad$ Q = LEADING COEF

q = potential roots $= \pm \frac{P}{Q}$

TABLE VALUES

↓Q	P→

II) TRY POT. ROOTS TO FIND (1)

Test (1)

$x = (2) \longrightarrow P(2) = 0 \Rightarrow$ ROOT (1) $\qquad$ (2)

III) $P(x) = \underbrace{15x^3 - 32x^2 + 3x + 2}_{A(\text{Std. form})^{(3)}} = \underbrace{(x - (2))}_{B(\text{root})} \cdot \underbrace{(V(X))}_{c(\text{Qdtic equation})}$

(all roots) → $(x - (2)) \cdot (x - (\;)) \cdot (x - (\;))$

IV) LONG DIVISION $\qquad \frac{A}{B \cdot C} = 1 \Rightarrow A = B \cdot C$

$\frac{15x^3 - 32x^2 + 3x + 2}{(x - 2)} = V(x) \qquad \frac{A}{B} = C$

$C = \frac{P(x)}{(1\text{root})}$

Based on relationship let's find $C(x)$

$$\frac{15x^3-32x^2+3x+2}{(x-2)} = (x-2)\overline{)15x^3-32x^2+3x+2}$$

$$\begin{array}{r|l} 15x^3-32x^2+3x+2 & x-2 \\ \hline -\ 15x^3+30x^2 & \underbrace{\{15x^2-2x-1\}}_{C(x)} \\ -2x^2+3x+2 & \\ +\ 2x^2-4x & \\ \hline -x+2 & \\ +\ x-2 & \\ \hline 0 & \end{array}$$

1st root (r_1)

$P(x)/(x-r_1)$

$A = B \cdot C \Rightarrow$

$P(x) = (x-2) \cdot (15x^2-2x-1)$

SOLVE 2ND DEGREE P(X):

ST.F² = $A.x^2 + Bx + C$

$15x^2 + 2x - 1$

WHAT ARE THE ROOTS ?

BASKHARA:

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

$x' = 1/3$

$x'' = -1/5$

Δ

$\sqrt{64} = 8$

$4+60$

$$x' = \frac{-(-2)+\sqrt{(-2)^2-4.(15).(-1)}}{2\times(15)}$$

$$x'' = \frac{+2-(8)}{30}$$

$$x'' = \frac{2+8}{30} = \frac{10}{30} = \left(\frac{1}{3}\right)$$

$$x'' = \frac{2-8}{30} = \frac{-6}{30} = \left(\frac{-1}{5}\right)$$

$P(x) = (x-2).(x-1/3).(x-(-1/5)) =$

$= (x-2)(x-1/3).(x+1/5)$

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$y(x) = 0 \leftarrow$ ROOTS

$\boxed{\text{ROOTS}}$

$a \cdot b \cdot c = 0$

$A = \underbrace{(x-2)}_{B}\underbrace{(x-1/3)(x+1/5)}_{C} = 0$ Root form

$(x-2) = 0$ OR/AND
$\boxed{x = 2}$

$(x-1/3) = 0$ OR/AND
$\boxed{x = +1/3}$

$(x+1/5) = 0$
$\boxed{x = -1/5}$

Bhaskara

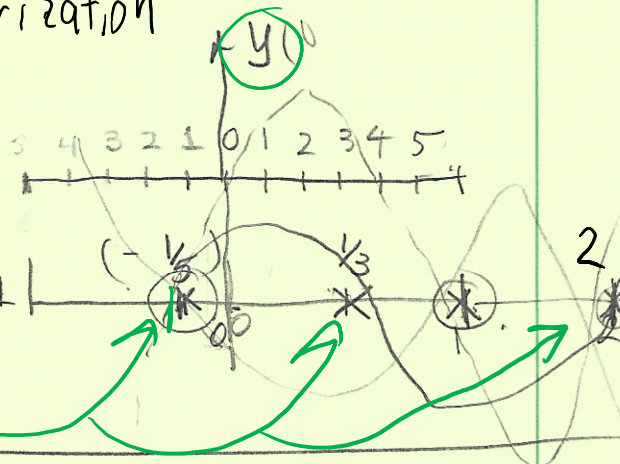
$(x-2).(15x^2-2x-1)$

$\underbrace{B \circ C}$

Factorization

$\underbrace{15x^3 - 32x^2 + 3x + 2}_{A}$ STND FORM

{ Roots! } $y = 0$



$\sqrt{2}$	$1 + i$
$-\sqrt{2}$	$-(1+i)$

$2x^4 - x^3 + 3x^2 - 1 = 0$

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$x^3 + 6x^2 + 5x - 4$

	+	−	i	
P(x)	1	0	0	
P(−x)	0	2	0	I
P(−x)	0	0	2	II

+	−	i
1	2	0
1	0	2

− + − −

☆ THIS TECHNIQUE COULD BE APPLIED BEFORE RAT. ROOTS THEOREM, TO HELP FIND MOST LIKELY VALUES TO TRY IN PART II of Page 3.

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