1.5 Remainder Theorem and Roots of an Equation

Day 7 04/01/15

Apr 1-6:54 AM

Step 1 Determine the factors of the constant term and the factors of the leading coefficient.

P

Q

P: $\pm 1, \pm 3, \pm 9$

Q: ± 1

Apr 1-8:05 AM

Step 2 Find all the possible roots by dividing the factors of the constant term by the factors of the leading coefficient. (fractions)

$$\frac{P}{Q} = \pm\frac{1}{1}, \pm\frac{3}{1}, \pm\frac{9}{1}$$

$$\pm 1, \pm 3, \pm 9$$

Apr 1-8:06 AM

Step 3 Substitute each possible root into the polynomial until you find one that causes the polynomial to equal zero. This is one rational root.

Test:

1: $1(1)^3 + 2(1) - 9$

$1 + 2 - 9 = -6 \neq 0$

3: $(3)^3 + 2(3) - 9$

$27 + 6 - 9 = 24 \neq 0$

Apr 1-8:06 AM

Step 4 Factor the polynomial by synthetic division using the first rational root as the divisor.

Apr 1-8:07 AM

① $x^3 - x^2 - 8x + 12$

Step 1:

p: 12 1, 2, 3, 4, 6, 12

Q: 1 1

S2: $\frac{P}{Q}$: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

Step 3: Test $x^3 - x^2 - 8x + 12$

1: $(1)^3 - (1)^2 - 8(1) + 12$

$1 - 1 - 8 + 12 = 2 \neq 0$

-1: $(-1)^3 - (-1)^2 - 8(-1) + 12$

2: $(2)^3 - (2)^2 - 8(2) + 12$

$8 - 4 - 16 + 12 = 0$

winner!

Apr 1-8:35 AM

Step 4:

$$\begin{array}{c|cccc} 2 & 1 & -1 & -8 & 12 \\ & \downarrow & 2 & 2 & -12 \\ \hline & 1 & 1 & -6 & 0 \end{array}$$

$(x-2)(x^2 + x - 6)$

Step 5: Factor $(x^2 + x - 6)$

$(x + 3)(x - 2)$ (6: 2, 3)

Answer: $(x-2)(x+3)(x-2)$

Apr 1-8:41 AM

What are the rational roots of $2x^3 + x^2 - 7x - 6 = 0$?

Step 1 & 2:

$\frac{P}{Q}$: $\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}$

Step 3: Test

1: $2(1)^3 + (1)^2 - 7(1) - 6$

$2 + 1 - 7 - 6 = -10 \neq 0$

-1: $2(-1)^3 + (-1)^2 - 7(-1) - 6$

$-2 + 1 + 7 - 6 = 0$

$-1 + 7 - 6$

$-1 + 1 = 0$

Mar 31-6:46 AM

Step 4:

$$\begin{array}{c|cccc} -1 & 2 & 1 & -7 & -6 \\ & \downarrow & -2 & 1 & +6 \\ \hline & 2 & -1 & -6 & 0 \end{array}$$

$(x+1)(2x^2-x-6)$

Step 5:

$2x^2-x-6$

12, $+12$, $2\ \ 6$, $3\ \ 4$

x^2-x-12

$(x+3)(x-4)$ ÷2

$\frac{x+3}{2}$ $\frac{x-4}{2}$

$(x+1)(2x+3)(x-2)$

Apr 1-8:56 AM

What are the rational roots of $15x^3 - 32x^2 + 3x + 2 = 0$?

Mar 31-6:45 AM