8-5 The Remainder and Factor Theorems Page 372

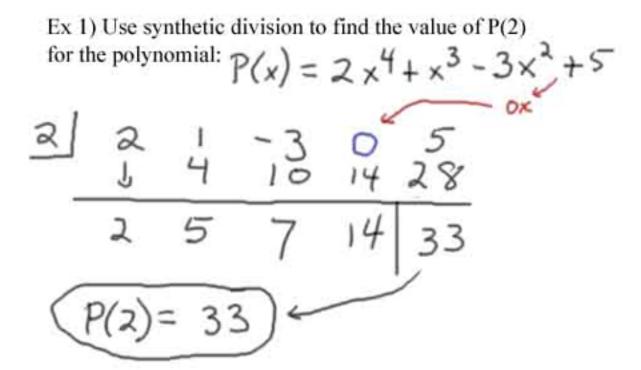
Remainder Theorem

If P(x) is a polynomial of degree n (n>0), then for any number r.

 $P(x) = Q(x) \cdot (x-r) + P(r)$, where Q(x) is a polynomial of degree n-1.

In other words: For the polynomial P(x), the function value P(r) is the remainder when P(x) is divided by x - r.

To find P(r), we can substitute "r" into the function P(x) everywhere an x occurs and simplify or, use synthetic division by (x-r) to find the remainder. Hence the name of the theorem, the Remainder Theorem.



Factor Theorem

A polynomial P(x) has (x-r) as a factor if and only if r is a root of the equation P(x) = 0.

Ex 2) Determine if x + 1 is a factor of the polynomial:

EX3 Find the polynomial whose solutions are: 1, 2, = ×=1, メ=マ,×=き (X-1)(X+2)(X-==0 (x-1)(x+2) 2·(x-3)=0·2 (x-1)(x+2)(2x-3)=0(x2+2x-x-2)(2x-3)=0 $(x^2 + x^{-2})(2x-3) = 0$ 2x3+2x2-4x -3x2-3x+6 2x3-x2-7x+6=0 $P(x) = 2x^3 - x^2 - 7x + 6$

Solve \times + \times + 10=0 if -2 is a root. -2/ 1 0° 1 10 1 -2 4 -10 |x^2-2x+5| 0 depressed equation χ^2 -2x+5=0 use Quadratic Formula α =1 b=-2 C=5

$$X = \frac{2 \pm \sqrt{1 + 3^{2} - 4(1)(5)}}{2(1)}$$

$$X = \frac{a \pm \sqrt{4 - 20}}{2}$$

$$X = \frac{2 \pm \sqrt{1 - 16}}{2}$$

$$X = \frac{2 \pm 4i}{2}$$

$$X = \frac{2(1 \pm 2i)}{2}$$

$$X = \frac{2(1 \pm 2i)}{2}$$