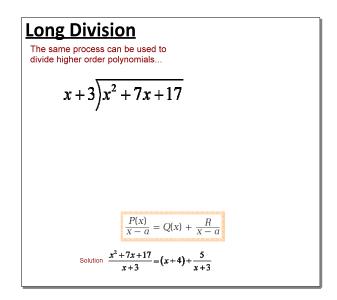
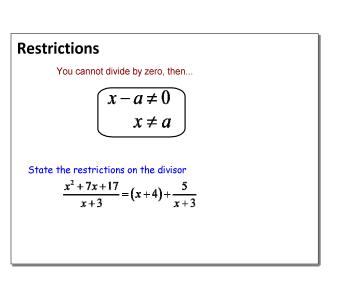


Long Division Let's review the process of long division... 12)327



The Quotient
$$\frac{P(x)}{x-a} = Q(x) + \frac{R}{x-a}$$
 x-a is the divisor Q(x) is the quotient R is the remainder
$$P(x) = Q(x)(x-a) + R$$
 Rewrite the division statement
$$\frac{x^2 + 7x + 17}{x + 3} = (x + 4) + \frac{5}{x + 3}$$



Example

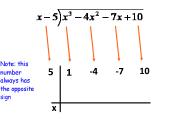
- a) Divide the polynomial $P(x)=x^4-2x^3+x^2-3x+4$ by x-1. Express the result in the form $\frac{P(x)}{x-a}=Q(x)+\frac{R}{x-a}$.
- **b)** Identify any restrictions on the variable.
- c) Verify your answer.

Your turn...

$$\frac{2x^4-5x^2-2x}{x-2}$$

- Divide the polynomialState the restrictionsCheck your answer

Synthetic Division



The 'set-up'

The Remainder Theorem provides us with a shortcut to find out what the remainder will be

REMAINDER THEOREM

If a polynomial p(x) is divided by a binomial (x - a), then the remainder can be found by determining p(a)

'a' is backwards

$$\frac{x^3 + 7x^2 - 3x + 4}{x - 2}$$

Example

Divide using synthetic division

$$\frac{x^3 + 7x^2 - 3x + 4}{x - 2}$$

What is the remainder when $x^3 - 4x^2 - 7x + 10$ is divided by x - 2?

Long Division

Synthetic Division

Remainder Theorem

Your Turn

What is the remainder when $11x - 4x^4 - 7$ is divided by x - 3? Verify your answer using either long or synthetic division.

Key Ideas

- Use long division to divide a polynomial by a binomial.
- Synthetic division is an alternate form of long division.
- The result of the division of a polynomial in x, P(x), by a binomial of the form x-a can be written as $\frac{P(x)}{x-a} = Q(x) + \frac{R}{x-a}$ or P(x) = (x-a)Q(x) + R, where Q(x) is the quotient and R is the remainder.
- \bullet To check the result of a division, multiply the quotient, Q(x), by the divisor, x-a, and add the remainder, R, to the product. The result should be the dividend, P(x).
- The remainder theorem states that when a polynomial in x, P(x), is divided by a binomial, x-a, the remainder is P(a). A non-zero remainder means that the binomial is not a factor of P(x).

AssignMent

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1 - 7 Level 2

8 - 10 Level 3

11, 14, 17, C2, C3 Level 4

Your Turn

The volume of a rectangular prism is given by $V(x) = x^3 + 3x^2 - 36x + 32$. Determine possible measures for w and h in terms of x if the length, l, is x-4.

