


Notes Synthetic Division

Recall when you divide :



Synthetic division of polynomials is a condensed division method. To use synthetic division, the divisor must be in the form $x - c$, where c is a number.

To perform synthetic division:

1. Determine the divisor, which is the opposite of the number with x .
2. Make an upside down division bar  and place the divisor outside on the left and the COEFFICIENTS of the dividend on the inside. Be sure to account for any missing terms.
3. Bring down the first number of the dividend.
4. Multiply the divisor and the number brought down and place the product under the next coefficient in the dividend.
5. Add down.
6. Repeat steps 4 – 5 until you run out of columns.

Note: the quotient (answer for the division) will begin 1 degree less than your dividend and the numbers obtained will be the coefficients of the quotient.

Perform the indicated divisions using synthetic division

EX1:
$$\frac{3x^2 + 5x + 2}{x + 1}$$

$$\text{EX2: } \frac{3x^2 + 5}{x - 1}$$

$$\text{EX3: } \frac{x^3 + 4x^2 - 5x - 9}{x + 5}$$

$$\text{EX4: } \frac{x^4 + 32}{x + 2}$$

- Recall in order to be a FACTOR, you must divide the dividend evenly (have a remainder of zero)
- The last number we obtain when we synthetically divide is our remainder. If this number is ZERO that means that the divisor is a factor of the dividend.

Use synthetic division to find the remainder when $f(x)$ is divided by $d(x)$ to decide if $d(x)$ is a factor of $f(x)$. If $d(x)$ is a factor of $f(x)$, express $f(x)$ as $d(x) \cdot q(x)$

EX5: $f(x) = 2x^3 + 7x^2 - x + 12$ and $d(x) = x + 4$

EX6: $f(x) = 2x^3 - 3x + 1$ and $d(x) = x - 1$

EX7: $f(x) = 6x^4 - 7x^3 - 11x^2 + 2x + 3$ and $d(x) = x + 1$