*Synthetic division* is an efficient process that minimizes the “clutter” (variables and some numbers) when dividing. However, it can only be used when dividing by a binomial. If the leading coefficient of the binomial is not 1, you must do some adjustment. (Won’t have to in homework – see “To Think About”.)

Ex 1 Use synthetic division to divide.

\*Note: synthetic division only works when dividing by terms of the form (x-a)

1. (no Remainder)
2. 5.3.4 Ans:
3. 5.3.8 (Remainder)
4. 5.3.10 (Remainder) Ans:

(don’t forget to save the place of the x term)

Other problems

1. divided by Ans:
2. Ans:
3. Ans:

Challenge problem:

What about the case where we are not dividing by something of the form x-a?

Consider:

5.3.25 so carry out the synthetic division and don’t forget to multiply our result by ½.

## The Remainder Theorem

The remainder obtained by dividing by is .

I.E. where

Ex: Given then find

so

To learn more about this, try problem 6.7.37

To Prove the remainder theorem, note that any polynomial can be rewritten as , where is the quotient polynomial, and R is some constant number that is the remainder from the division.

1. How do we know that R must be a constant?
2. Show that (this says that is the remainder when is divided by .

