

Dividing a Polynomial by a Polynomial:

Dividing one polynomial by another is very similar to long division.

Example 3: Divide $(6x^2 + 8x + 8)$ by $(3x + 1)$.

Step 1:
$$\begin{array}{r} 3x+1 \overline{) 6x^2+8x+8} \\ \underline{6x^2+2x} \\ 6x+8 \\ \underline{6x+2} \\ 6 \end{array}$$

Step 1: Write the problem as a long division problem. The binomial belongs on the outside of the division symbol because it is the term we are dividing by.

Step 2: Now, we can begin dividing.

~~$(3x)(2x) = 6x^2$~~ So, $2x$ belongs above the $8x$.

Step 3: The next step is to multiply $2x$ by $(3x + 1)$.

$(2x)(3x + 1) = 6x^2 + 2x$ Subtract that product from $6x^2 + 8x$. Now, bring the $+ 8$ straight down beside the $6x$.

Step 4: $(3x)(2) = 6x$, so we place the 2 above the 8 in the answer.

Step 5: Multiply 2 by $(3x + 1)$ to get $6x + 2$. Subtract $(6x + 2)$ from $(6x + 8)$. There is a remainder of 6 , so we write the remainder as a fraction with the binomial as the denominator.

Answer: $2x + 2 + \frac{6}{3x + 1}$