

# 1.1 DIVIDING A POLYNOMIAL BY A BINOMIAL

Note Title

07/09/2012

Review:

Divide.

1)  $248 \div 4$

$$\begin{array}{r} 62 \\ 4 \overline{) 248} \\ \underline{-24} \phantom{0} \\ 08 \end{array}$$

2)  $3026 \div 5$  (remainder)

$$\begin{array}{r} 605 \text{ R } 1 \\ 5 \overline{) 3026} \\ \underline{-30} \phantom{0} \\ 026 \\ \underline{-25} \phantom{0} \\ 1 \end{array}$$

3)  $(2x^3 - 16x^2 + 24x) \div (2x)$

$$\begin{array}{r} 2x^3 - 16x^2 + 24x \\ \underline{2x^3} \phantom{0} \\ 2x \end{array}$$

$$\underline{2x(x^2 - 8x + 12)} \quad x \neq 0 \text{ (Restriction)}$$

4)  $(x^2 - x - 12) \div (x + 3)$

$$\begin{array}{r} x^2 - x - 12 \\ \underline{x + 3} \end{array}$$

$$= \frac{(x-4)(x+3)}{x+3}, \quad x \neq -3$$

LONG DIVISION:

Divide  $(x^2 - x - 12) \div (x + 2)$

$$\begin{array}{r} \text{Quotient: } x - 3 \\ \text{Divisor: } x + 2 \overline{) x^2 - x - 12} \\ \underline{+ 2x} \phantom{0} \\ -3x - 12 \\ \underline{+ 3x + 6} \\ -6 \end{array}$$

Remainder

1) Divide  $x^2$  by  $x$  and write on top

2) Multiply  $x$  by  $x+2$  and write underneath

3) Subtract

Try:  $(x^2 - 6x + 10) \div (x - 8)$

$$\begin{array}{r} \text{Quotient: } x + 2 \\ \text{Divisor: } x - 8 \overline{) x^2 - 6x + 10} \\ \underline{-x^2 + 8x} \phantom{0} \\ 2x + 10 \\ \underline{-2x + 16} \\ 26 \end{array}$$

Division Statement:

$$\frac{x^2 - 6x + 10}{x - 8} = x + 2 + \frac{26}{x - 8}$$

$$\frac{P}{D} = Q + \frac{R}{D}$$

Other form of the division statement:

$$x^2 - 6x + 10 = (x+2)(x-8) + 26$$

$$P = Q \times D + R$$

\*use this to check answer!

$$(x+2)(x-8) + 26$$

$$= x^2 - 6x - 16 + 26$$

$$= x^2 - 6x + 10$$

!!

### SYNTHETIC DIVISION

Divide  $(x^2 - 6x + 10) \div (x - 8)$

what # would make this zero?  $x = 8$

$$\begin{array}{r|rrrr} 8 & 1 & -6 & 10 & \\ & \downarrow & \textcircled{8} & 16 & \\ \hline & 1 & 2 & 26 & \end{array}$$

1) Multiply  $8 \times 1$

2) Add  $-6 + 8$

←  
increasing  
powers  
of  $x$

Remainder

So we get  
 $x + 2$  R 26

Try: Divide  $(x^3 - 2x + 5) \div (x + 3)$

↑  
 $x^2$  term is missing so  
add in a  $0x^2$

$$(x^3 + 0x^2 - 2x + 5) \div (x + 3)$$

$$\begin{array}{r|rrrr} -3 & 1 & 0 & -2 & 5 \\ & -3 & 9 & -21 & \\ \hline & 1 & -3 & 7 & -16 \end{array}$$

$$x^2 - 3x + 7 \text{ R } -16$$