

February 4

## Polynomial Long Division

(Ex)  $(m^2 - 7m - 11) \div (m - 8)$

\* terms must be in order from highest exponent to lowest exponent

\* must have every exponent down from the highest exponent

$$\begin{array}{r} m-8 \overline{) m^2 - 7m - 11} \\ \underline{-m^2 + 8m} \phantom{-11} \\ m - 11 \\ \underline{-m + 8} \\ -3 \end{array}$$

↑  
Remainder

step 1: Divide first term by first term.

$$\frac{m^2}{m^1} = m$$

step 2: Multiply.

step 3: Subtract. (Change signs, then combine.)

step 4: Bring down next term.

step 5: Repeat until nothing left to bring down.

$$\frac{m}{m} = 1$$

Ex2  $(3x^3 + 13x^2 + 2x - 8) \div (3x - 2)$

$$\begin{array}{r}
 \boxed{x^2 + 5x + 4} \\
 3x - 2 \overline{) 3x^3 + 13x^2 + 2x - 8} \\
 \underline{-3x^3 + 2x^2} \phantom{+ 2x - 8} \\
 15x^2 + 2x \phantom{- 8} \\
 \underline{-15x^2 + 10x} \phantom{- 8} \\
 12x - 8 \\
 \underline{-12x + 8} \\
 0
 \end{array}$$

$$\frac{3x^3}{3x} = x^2$$

$$\frac{15x^2}{3x} = 5x$$

$$\frac{12x}{3x} = 4$$

Remainder  
(don't have to write remainders of 0.)

Ex3  $(a^3 - 30a + 18 - 4a^2) \div (a + 3)$   
 $(a^3 - 4a^2 - 30a + 18) \div (a + 3)$

$$\begin{array}{r}
 \boxed{a^2 - 7a - 9 + \frac{45}{a+3}} \\
 a + 3 \overline{) a^3 - 4a^2 - 30a + 18} \\
 \underline{-a^3 + 3a^2} \phantom{- 30a + 18} \\
 7a^2 - 30a \phantom{+ 18} \\
 \underline{-7a^2 + 21a} \phantom{+ 18} \\
 -9a + 18 \\
 \underline{+9a + 27} \\
 45
 \end{array}$$

$$\frac{a^3}{a} = a^2$$

$$\frac{-7a^2}{a} = -7a$$

$$\frac{-9a}{a} = -9$$

Remainder

Ex4  $(z^2 - 28) \div (z + 5)$

$(z^2 + 0z - 28) \div (z + 5)$

$$\begin{array}{r} z+5 \overline{) z^2 + 0z - 28} \\ \underline{-5z} \phantom{-28} \\ -5z - 28 \\ \underline{+5z + 25} \\ -3 \end{array}$$

$\uparrow$   
Remainder

$$\frac{z^2}{z} = z$$

$$\frac{-5z}{z} = -5$$