

#6 HW Long & Synthetic Division

Name _____

Divide using LONG DIVISION

1. $(x^3 + 2x^2 - x - 2) \div (x + 2)$

$$\begin{array}{r} x^2 + 0x - 1 \\ x+2 \overline{) x^3 + 2x^2 - x - 2} \\ \underline{x^2(x+2)} \\ 0 - x \\ 0 \\ - x - 2 \\ \underline{-1(x+2)} \\ 0 \end{array}$$

$x^2 - 1$

2. $(x^4 - 3x^3 - 7x^2 - 14) \div (x - 4)$

$$\begin{array}{r} x^3 + x^2 - 3x - 12 \\ x-4 \overline{) x^4 - 3x^3 - 7x^2 + 0x - 14} \\ \underline{x^3(x-4)} \\ x^3 - 7x^2 \\ \underline{- (x^3 - 4x^2)} \\ -3x^2 + 0x \\ \underline{- (-3x^2 + 12x)} \\ -12x - 14 \\ \underline{- (-12x + 48)} \\ -62 \end{array}$$

$x^3 + x^2 - 3x - 12 - \frac{62}{x-4}$

Divide using SYNTHETIC DIVISION

3. $(x^2 + 5x + 6) \div (x + 1)$

$$\begin{array}{r|rrr} -1 & 1 & 5 & 6 \\ & & -1 & -4 \\ \hline & 1 & 4 & 2 \end{array}$$

$x + 4 + \frac{2}{x+1}$

4. $(x^4 + 6x^3 - 7x - 14) \div (x - 4)$

$$\begin{array}{r|rrrrr} 4 & 1 & 6 & 0 & -7 & -14 \\ & & 4 & 40 & 160 & 612 \\ \hline & 1 & 10 & 40 & 153 & 598 \end{array}$$

$x^3 + 10x^2 + 40x + 153 + \frac{598}{x-4}$

Use SYNTHETIC SUBSTITUTION to evaluate the polynomial with the given value.

5. $P(x) = 2x^2 - 5x - 3$
for $x = 4$

$$\begin{array}{r|rr} 4 & 2 & -5 & -3 \\ & & 8 & 12 \\ \hline & 2 & 3 & 9 \end{array}$$

$P(4) = 9$

6. $P(x) = 4x^3 - 5x^2 + 3$
for $x = -1$

$$\begin{array}{r|rrr} -1 & 4 & -5 & 0 & 3 \\ & & -4 & 9 & -9 \\ \hline & 4 & -9 & 9 & -6 \end{array}$$

$P(-1) = -6$

Determine whether the given binomial is a factor of the polynomial $P(x)$. Explain WHY!!

7. $(x - 3); P(x) = 4x^6 - 12x^5 + 2x^3 - 6x^2 - 5x + 10$

$$\begin{array}{r|rrrrrr} 3 & 4 & -12 & 0 & 2 & -6 & -5 & 10 \\ & & 12 & 0 & 0 & 6 & 0 & -15 \\ \hline & 4 & 0 & 0 & 2 & 0 & -5 & -5 \end{array}$$

$(x-3)$ is not a factor of $P(x)$ b/c the remainder is not equal to 0

8. $(x - 8); P(x) = x^5 - 8x^4 + 8x - 64$

$$\begin{array}{r|rrrrr} 8 & 1 & -8 & 0 & 0 & 8 & -64 \\ & & 8 & 0 & 0 & 0 & 64 \\ \hline & 1 & 0 & 0 & 0 & 8 & 0 \end{array}$$

$(x-8)$ is a factor of $P(x)$ because the remainder = 0