

HOMWORK: POLYNOMIAL DIVISION

NAME: _____ DAY 7 DUE: _____

Algebra 2 HW

Name _____

5.5 Synthetic Division, Factors, & Zeros

Date _____

Part I. Perform synthetic division (SD). Write the answer completely.

$(x^2 + 7x + 12) \div (x + 4)$ $\begin{array}{r rrr} -4 & 1 & 7 & 12 \\ & \downarrow & -4 & -12 \\ \hline & 1 & 3 & 0 \end{array}$ $x + 3$	$(x^3 - 3x^2 + 8x - 5) \div (x - 1)$ $\begin{array}{r rrrr} 1 & 1 & -3 & 8 & -5 \\ & \downarrow & 1 & -2 & 6 \\ \hline & 1 & -2 & 6 & 1 \end{array}$ $x^2 - 2x + 6 + \frac{1}{x-1}$
$(x^4 - 7x^2 + 9x - 10) \div (x - 2)$ $\begin{array}{r rrrrr} 2 & 1 & 0 & -7 & 9 & -10 \\ & \downarrow & 2 & 4 & -6 & 6 \\ \hline & 1 & 2 & -3 & 3 & -4 \end{array}$ $x^3 + 2x^2 - 3x + 3 + \frac{-4}{x-2}$	$(2x^4 - x^3 + 4) \div (x + 1)$ $\begin{array}{r rrrrr} -1 & 2 & -1 & 0 & 0 & 4 \\ & \downarrow & -2 & 3 & -3 & 3 \\ \hline & 2 & -3 & 3 & -3 & 7 \end{array}$ $2x^3 - 3x^2 + 3x - 3 + \frac{7}{x+1}$

Part II. Get the k-value from the factor. Use SD & factor $f(x)$ completely.

$f(x) = x^3 - 3x^2 - 16x - 12; x - 6$ $\begin{array}{r rrrr} 6 & 1 & -3 & -16 & -12 \\ & \downarrow & 6 & 18 & 12 \\ \hline & 1 & 3 & 2 & 0 \end{array}$ $f(x) = (x-6)(x^2 + 3x + 2)$ $f(x) = (x-6)(x+2)(x+1)$	$f(x) = x^3 - 18x^2 + 95x - 126; x - 9$ $\begin{array}{r rrrr} 9 & 1 & -18 & 95 & -126 \\ & \downarrow & 9 & -81 & 126 \\ \hline & 1 & -9 & 14 & 0 \end{array}$ $f(x) = (x-9)(x^2 - 9x + 14)$ $f(x) = (x-9)(x-7)(x-2)$
$f(x) = x^3 - x^2 - 21x + 45; x + 5$ $\begin{array}{r rrrr} -5 & 1 & -1 & -21 & 45 \\ & \downarrow & -5 & 30 & -45 \\ \hline & 1 & -6 & 9 & 0 \end{array}$ $f(x) = (x+5)(x^2 - 6x + 9)$ $f(x) = (x+5)(x-3)^2$	$f(x) = 3x^3 - 16x^2 - 103x + 36; x + 4$ $\begin{array}{r rrrr} -4 & 3 & -16 & -103 & 36 \\ & \downarrow & -12 & 112 & -36 \\ \hline & 3 & -28 & 9 & 0 \end{array}$ $f(x) = (x+4)(3x^2 - 28x + 9)$ $f(x) = (x+4)(3x-1)(x-9)$

Part III. Use SD and factor the result. Then get the zeros from factors.

Find all zeros!

One zero is already provided.

$f(x) = x^3 + 2x^2 - 20x + 24; -6$ $\begin{array}{r rrrr} -6 & 1 & 2 & -20 & 24 \\ & \downarrow & -6 & 24 & -24 \\ \hline & 1 & -4 & 4 & 0 \end{array}$ $f(x) = (x+6)(x^2 - 4x + 4)$ $f(x) = (x+6)(x-2)^2$ $x = -6, 2, 2$ $x = -6, 2$	$f(x) = x^3 - 9x^2 - 5x + 45; 9$ $\begin{array}{r rrrr} 9 & 1 & -9 & -5 & 45 \\ & \downarrow & 9 & 0 & -45 \\ \hline & 1 & 0 & -5 & 0 \end{array}$ $f(x) = (x-9)(x^2 - 5)$ $x-9=0 \quad x^2-5=0$ $x=9 \quad x^2=5$ $x = \pm\sqrt{5}$ $x = 9, \pm\sqrt{5}$
$f(x) = 2x^3 + 3x^2 - 39x - 20; 4$ $\begin{array}{r rrrr} 4 & 2 & 3 & -39 & -20 \\ & \downarrow & 8 & 44 & 20 \\ \hline & 2 & 11 & 5 & 0 \end{array}$ $f(x) = (x-4)(2x^2 + 11x + 5)$ $f(x) = (x-4)(2x+1)(x+5)$ $x = 4, -\frac{1}{2}, -5$	$f(x) = x^3 - 3x^2 - 45x + 175; -7$ $\begin{array}{r rrrr} -7 & 1 & -3 & -45 & 175 \\ & \downarrow & -7 & 70 & -175 \\ \hline & 1 & -10 & 25 & 0 \end{array}$ $f(x) = (x+7)(x^2 - 10x + 25)$ $f(x) = (x+7)(x-5)^2$ $x = -7, 5, 5$ $x = -7, 5$

One zero of $f(x) = x^3 + x^2 + 2x + 24$ is -3 . Find all the zeros.

1. Synthetic Division - because $f(-3) = 0$, $x = -3$ is a zero, and also $x + 3$ is a factor

$$\begin{array}{r|rrrr} -3 & 1 & 1 & 2 & 24 \\ & \downarrow & -3 & 6 & -24 \\ \hline & 1 & -2 & 8 & 0 \end{array}$$

2. Write as a product of 2 factors: $f(x) = (x+3)(x^2 - 2x + 8)$

3. Then completely factor:

$$f(x) = (x+3)(x+2)(x-4)$$

4. Graph!

$$x = -3, -2, 4$$

Degree = 3

LC = +1

