Name: ______________________________ Period: __________ Date: ____________________

Considering the Factor Theorem, determine if the given linear factor(s) (or root(s)) is(are) a factor of the polynomial. Once you've made this determination, write yes or no in the column with the possible factor(s) or root(s).

if the given linear factor(s) (or root(s)) **is(are)** a factor of the function, completely factor the polynomial (further factor the quotient and rewrite to include the original factor). Sketch a graph from the factored form and solve.

: For the functions whose possible linear factors (or roots) were **not** factors of the function, use a graphing calculator to determine a root/factor and use that information to completely factor the polynomial and solve.

Function:	Possible Linear Factor(s) (or root(s)):
1. $f(x) = x^4 - 4x^3 - 39x^2 + 46x + 80$	$(x-8)\ and\ (x-2)$
2. $g(x) = x^5 + 2x^4 - 21x^3 - 38x^2 + 80x + 96$	$(x+5)$
3. $h(x) = x^4 + 6x^3 - x^2 - 54x - 72$	$(x-7)$
4. $m(x) = x^5 + 4x^4 - 5x^3 - 20x^2 + 4x + 16$	$(x+4)$
5. $n(x) = x^3 - 6x^2 + 12x - 8$	$x = 2$
6. $p(x) = x^4 - 7x^3 + 27x - 189$	$x = 10$
7. $q(x) = x^4 + 7x^3 - 12x^2 - 176x - 320$	$(x-5)\ and\ (x+4)$
8. $r(x) = x^5 + 9x^4 + 5x^3 - 105x^2 - 126x + 216$	$x = -5\ and\ x = 2$

Example:

Function:	Possible Linear Factor(s) (or root(s)):
$f(x) = x^4 - 4x^3 - 22x^2 + 4x + 21$	$x = -3$

$$\begin{array}{r|rrrrr} -3 & 1 & -4 & -22 & 4 & 21 \\ & \downarrow & -3 & 21 & 3 & -21 \\ \hline & 1 & -7 & -1 & 7 & \boxed{0} \\ & x^3 & x^2 & x & c & R \end{array}$$

Yes, $x+3$ is a factor of $f(x)$ because the remainder $= 0$.

$$f(x) = (x+3)(x^3 - 7x^2 - x + 7)$$

factor by grouping...

$$= (x+3)\left((x^3 - 7x^2) + (-x + 7)\right)$$

$$= (x+3)\left(x^2(x-7) - 1(x-7)\right)$$

$$= (x+3)(x-7)(x^2-1)$$

$$0 = (x+3)(x-7)(x+1)(x-1)$$

to solve set $= 0$

$x+3=0$, $x-7=0$, $x+1=0$, $x-1=0$

$x=-3$, $x=7$, $x=-1$, $x=1$