Name Schlansky   Date ____________

Mr. Schlansky   Algebra II

Finding k in a Polynomial Equation

1. Consider the polynomial $p(x) = x^3 + kx^2 + x + 6$. Find a value of k so that $x + 1$ is a factor of P. Find all the zeros of P.

$p(-1) = 0$

$0 = (-1)^3 + k(-1)^2 + -1 + 6$

$0 = -1 + k - 1 + 6$

$0 = k + 4$

$-4 \quad -4$

$-4 = k$

$p(x) = x^3 - 4x^2 + x + 6$

$$\frac{x^3 - 4x^2 + x + 6}{x+1}$$

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

$p(x) = (x+1)(x^2 - 5x + 6)$

$0 = (x+1)(x-3)(x-2)$

$x = -1 \quad x = 3 \quad x = 2$

2. Consider the polynomial $p(x) = x^3 + kx - 30$. Find a value of k so that $x + 3$ is a factor of P. Find all the zeros of P.

$p(-3) = 0$

$0 = (-3)^3 + k(-3) - 30$

$0 = -27 - 3k - 30$

$0 = -3k - 57$

$+57 \quad +57$

$\frac{57}{-3} = \frac{-3k}{-3}$

$-19 = k$

$p(x) = x^3 - 19x - 30$

$$\frac{x^3 - 19x - 30}{x+3}$$

$$\begin{array}{r|rrrr} -3 & 1 & 0 & -19 & -30 \\ & & -3 & 9 & 30 \\ \hline & 1 & -3 & -10 & 0 \end{array}$$

$p(x) = (x+3)(x^2 - 3x - 10)$

$p(x) = (x+3)(x-5)(x+2)$

$x = -3 \quad x = 5 \quad x = -2$

3. Given $p(x)=6x^3+31x^2+kx-12$, and $p(-4)=0$, algebraically determine all the zeros of $p(x)$.

$\rightarrow x+4$ is a factor

$0=6(-4)^3+31(-4)^2+k(-4)-12$

$0=-384+496-4k-12$

$0=-4k+100$

$-100 \quad -100$

$\frac{-100}{-4}=\frac{-4k}{-4}$

$25=k$

$p(x)=6x^3+31x^2+25x-12$

$\frac{6x^3+31x^2+25x-12}{x+4}$

$$\begin{array}{r|rrrr} -4 & 6 & 31 & 25 & -12 \\ & & -24 & -28 & 12 \\ \hline & 6 & 7 & -3 & 0 \end{array}$$

$p(x)=(x+4)(6x^2+7x-3)$ PT

$p(x)=(x+4)(6x^2+7x-3)$

$p(x)=(x+4)(x^2+7x-18)$

$(x+\frac{9}{6})(x-\frac{2}{6})$

$(x+\frac{3}{2})(x-\frac{1}{3})$

$p(x)=(x+4)(2x+3)(3x-1)$

$x+4=0$	$2x+3=0$	$3x-1=0$
$-4 \quad -4$	$-3 \quad -3$	$+1 \quad +1$
$x=-4$	$\frac{2x}{2}=\frac{-3}{2}$	$\frac{3x}{3}=\frac{1}{3}$
	$x=-\frac{3}{2}$	$x=\frac{1}{3}$

4. Given $z(x)=6x^3+bx^2-52x+15$, $z(2)=35$, and $z(-5)=0$, algebraically determine all the zeros of $z(x)$.

$x+5$ is a factor

$0=6(-5)^3+b(-5)^2-52(-5)+15$

$0=-750+25b+260+15$

$0=25b-475$

$+475 \quad +475$

$\frac{475}{25}=\frac{25b}{25}$

$19=b$

$z(x)=6x^3+19x^2-52x+15$

$\frac{6x^3+19x^2-52x+15}{x+5}$

$$\begin{array}{r|rrrr} -5 & 6 & 19 & -52 & 15 \\ & & -30 & 55 & -15 \\ \hline & 6 & -11 & 3 & 0 \end{array}$$

PT

$z(x)=(x+5)(6x^2-11x+3)$

$z(x)=(x+5)(x^2-11x+18)$

$z(x)=(x+5)(x-\frac{9}{6})(x-\frac{2}{6})$

$z(x)=(x+5)(x-\frac{3}{2})(x-\frac{1}{3})$

$z(x)=(x+5)(2x-3)(3x-1)$

$x+5=0$	$2x-3=0$	$3x-1=0$
$-5 \quad -5$	$+3 \quad +3$	$+1 \quad +1$
$x=-5$	$\frac{2x}{2}=\frac{3}{2}$	$\frac{3x}{3}=\frac{1}{3}$
	$x=\frac{3}{2}$	$x=\frac{1}{3}$

5. Given $p(x)=x^3+5x^2+kx-24$, and $x+3$ is a factor, algebraically determine all the zeros of $p(x)$.

$p(-3)=0$

$0=(-3)^3+5(-3)^2+k(-3)-24$

$0=-27+45-3k-24$

$0=-3k-6$

$+6 \quad +6$

$\frac{6}{-3}=\frac{-3k}{-3}$

$-2=k$

$p(x)=x^3+5x^2-2x-24$

$\frac{x^3+5x^2-2x-24}{x+3}$

$$\begin{array}{r|rrrr} -3 & 1 & 5 & -2 & -24 \\ & & -3 & -6 & 24 \\ \hline & 1 & 2 & -8 & 0 \end{array}$$

$p(x)=(x+3)(x^2+2x-8)$

$0=(x+3)(x+4)(x-2)$

$x=3 \quad x=-4 \quad x=2$