Answers to Solving Extra Practice

1) Factors to: $x(x-2)(x+2)(x^2+5)=0$
   Roots: $\{0, 2, -2, i\sqrt{5}, -i\sqrt{5}\}$
2) Factors to: $(x^2+7)(x^2+6)=0$
   Roots: $\{i\sqrt{7}, -i\sqrt{7}, i\sqrt{6}, -i\sqrt{6}\}$
3) Factors to: $(x^2+8)(x^2+3)=0$
   Roots: $\{2i\sqrt{2}, -2i\sqrt{2}, i\sqrt{3}, -i\sqrt{3}\}$
4) Factors to: $(x^2+5)(x^2+2)=0$
   Roots: $\{i\sqrt{5}, -i\sqrt{5}, i\sqrt{2}, -i\sqrt{2}\}$
5) Factors to: $(x^2+2)(x-2)(x+2)=0$
   Roots: $\{i\sqrt{2}, -i\sqrt{2}, 2, -2\}$
6) Factors to: $(x-5)(x-2)(x+2)=0$
   Roots: $\{5, 2, -2\}$
7) Factors to: $(x-1)(x+1)(x^2+3)=0$
   Roots: $\{1, -1, i\sqrt{3}, -i\sqrt{3}\}$
8) Factors to: $x(x-2)(x+2)(x^2+4)=0$
   Roots: $\{0, 2, -2, 2i, -2i\}$
9) Factors to: $(x+1)(x^2-x+1)=0$
   Roots: $\left\{-1, \dfrac{1+i\sqrt{3}}{2}, \dfrac{1-i\sqrt{3}}{2}\right\}$
10) Factors to: $(x+2)(x^2-2x+4)=0$
    Roots: $\{-2, 1+i\sqrt{3}, 1-i\sqrt{3}\}$

Polynomial Basics:	
1.) by degree x^5+x^2-x+4 Quintic	2.) by number of terms $3x^2+4x+1$ Trinomial
3.) What is the degree of the polynomial expression: $3x^4+5x^7-2x-9$? 7	4.) Write the polynomial in standard form and identify the leading coefficient: $2x-x^2-4x^5-1$? $-4x^5-x^2+2x-1$ L.C. -4
Perform the indicated operation.	
5.) $(4x^3+2x^5-x)+(7x^5+5x)$ $9x^5+4x^3+4x$	6.) $(-3x^2-2x^3+5x)-(-9x^3+6x^2+11x)$ $7x^3-9x^2-6x$
7.) $(8x^3+2x)(4x^4+6x^3-8x^2)$ $32x^7+48x^6-56x^5+12x^4-16x^3$	8.) $(2x-5)^2$ $4x^2-20x+25$

$$(-3x^2-2x^3+5x)-(-9x^3+6x^2+11x)$$

$$\begin{array}{r} -3x^2-2x^3+5x \\ +\ -6x^2+9x^3-11x \\ \hline -9x^2+7x^3-6x \end{array}$$

$$7x^3-9x^2-6x$$

Use Long Division to Divide	
9.) $(3x^3 - 5x^2 + 10x - 3) \div (3x+1)$ $x^2 - 2x + 4 - \frac{7}{3x+1}$	10.) $(11x + 20x^2 + 12x^3 + 2) \div (3x+2)$ $4x^2 + 4x + 1$

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$$
\begin{array}{r}
4x^2+4x+1 \\
3x+2\,\big)\overline{12x^3+20x^2+11x+2} \\
-\cancel{12x^3}\ \overset{-}{+}\ 8x^2 \\
\hline
12x^2+11x \\
-\cancel{12x^2}\ \overset{-}{+}\ 8x \\
\hline
\cancel{3x}+\cancel{2} \\
-\cancel{3x}\ \overset{-}{+}\ \cancel{2} \\
\hline
\end{array}
$$

$\frac{12x^3}{3x} = 4x^2$

$4x^2(3x+2)$

$\frac{12x^2}{3x} = 4x$

$4x(3x+2)$

9

$$x^2-2x+4-\frac{7}{3x+1}$$

$$3x+1\overline{)3x^3-5x^2+10x-3}$$

$$\underline{-3x^3-x^2}$$

$$-6x^2+10x$$

$$\underline{+6x^2+2x}$$

$$12x-3$$

$$\underline{-12x-4}$$

$$-7$$

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

$$x^2(3x+1)$$

$$\frac{-6x^2}{3x}=-2x$$

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

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

Use Synthetic Division to Divide	
11.) $(x^3+6x^2-x-30)\div(x-2)$ $x^2+8x+15$	12.) $(5x^4-4x^3+0x^2+2x-1)\div(x+1)=0$ $5x^3-9x^2+9x-7+\frac{6}{x+1}$

$x-2=0$
$+2\quad +2$
$x=2$

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$$\begin{array}{r|rrrr} 2 & 1 & 6 & -1 & -30 \\ & \downarrow & 2 & 16 & 30 \\ \hline & 1 & 8 & 15 & \boxed{0} \end{array}$$

12

$$\begin{array}{r|rrrrr} -1 & 5 & -4 & 0 & 2 & -1 \\ & \downarrow & -5 & 9 & -9 & 7 \\ \hline & 5 & -9 & 9 & -7 & \boxed{6} \end{array}$$

Perform the indicated operation using the following functions: $f(x)=x-3$ $g(x)=x^2+9$ $h(x)=3x^2-10$ $j(x)=2x^3-5x^2+2$	
13.) h(x) + j(x) $2x^3-2x^2-8$	14.) $(f\circ g)(x) = x^2+6$
15.) f(5) – h(3) -15	16.) $\left(\frac{g}{h}\right)(2)$ $6.5 = \frac{13}{2}$

14) $f \circ g\,(x) = f(g(x))$

$g(x) \downarrow x^2+9$

$f(x) = x-3$

$f(x^2+9) = (x^2+9) - 3$

x^2+9-3

x^2+6

16

$\frac{g}{h}(2)$

$g(2) = (2)^2 + 9 = 13$

$h(2) = 3(2)^2 - 10 = 2$

$\frac{13}{2} = 6.5$

Perform the indicated operation using the following functions: $f(x)=x-3 \quad g(x)=x^2+9 \quad h(x)=3x^2-10 \quad j(x)=2x^3-5x^2+2$	
17.) g(f(x)) $x^2-6x+18$	18.) h(j(-4)) = 127,298
Use the Binomial Expansion Theorem to answer the following questions:	
19.) Find the 3rd term of the polynomial $(x-2)^5$ $40x^3$	20.) Simplify completely: $(3x+1)^4$ $81x^4+108x^3+54x^2+12x+1$

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$g(f(x))$

$\downarrow$

$x-3$

$g(x)=x^2+9$

$(\quad)^2+9$

$g(x-3) = (x-3)^2+9$

$(x-3)(x-3)+9$

$x^2-3x-3x+9+9$

$x^2-6x+18$

18) $h(j(-4))$

$j(-4) = 2(-4)^3 - 5(-4)^2 + 2$

$j(-4) = -206$

$h(-206) = 3(-206)^2 - 10$

$= 127{,}298$

20 $(3x+1)^4$

$$\begin{array}{c} 1 \\ 1 \quad 1 \\ 1 \quad 2 \quad 1 \\ 1 \quad 3 \quad 3 \quad 1 \\ 1 \quad 4 \quad 6 \quad 4 \quad 1 \end{array}$$

$1\underline{(3x)^4(1)^0} + 4\underline{(3x)^3(1)^1} + 6\underline{(3x)^2(1)^2} + 4\underline{(3x)^1(1)^3} + 1\underline{(3x)^0(1)^4}$

$1(3)^4(1)^0, 1, \quad 4(3)^3(1)^1 \quad 6(3)^2(1)^2 \quad 4(3)^1(1)^3$

$81x^4 + 108x^3 + 54x^2 + 12x + 1$