Algebra II – 5.5-5.7 Extra Practice Name: Key

Divide the following polynomials using long or synthetic division

1) $(x^3 + 2x^2 - 5x + 7) \div (x^2 + 4x - 1)$

$x - 2$

$x^2+4x-1 \overline{)\, x^3+2x^2-5x+7}$

$-x^3-4x^2+x$

$-2x^2-4x+7$

$+2x^2+8x-2$

$4x+5$

$\boxed{x-2+\frac{4x+5}{x^2+4x-1}}$

2) $(x^3 - 3x^2 + 8x - 5) \div (x - 1)$

1	1	-3	8	-5
	↓	1	-2	6
	1	-2	6	1

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

3) $(2x^4 - 11x^3 + 15x^2 + 6x - 18) \div (x - 3)$

3	2	-11	15	6	-18
	↓	6	-15	0	18
	2	-5	0	6	0

$\boxed{2x^3-5x^2+6}$

4) $(8x^3 + 5x^2 - 12x + 10) \div (x^2 - 3)$

$8x + 5$

$x^2+0x-3 \overline{)\, 8x^3+5x^2-12x+10}$

$-8x^3+0x^2+24x$

$5x^2+12x+10$

$-5x^2+0x+15$

$12x+25$

$\boxed{8x+5+\frac{12x+25}{x^2-3}}$

5) $(5x^4 - 7x^3 + x + 2) \div (x^2 - 3x + 2)$

$5x^2+8x+14$

$x^2-3x+2 \overline{)\, 5x^4-7x^3+0x^2+x+2}$

$-5x^4+15x^3-10x^2$

$8x^3-10x^2+x$

$-8x^3+24x^2-16x$

$14x^2-15x+2$

$-14x^2+42x-28$

$27x-26$

$\boxed{5x^2+8x+14+\frac{27x-26}{x^2-3x+2}}$

6) $(x^3 - 3x^2 + 8x - 5) \div (x - 1)$

1	1	-3	8	-5
	↓	1	-2	6
	1	-2	6	1

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

A polynomial f and a factor of f are given. Factor f completely.

7) $f(x) = x^3 - 3x^2 - 16x - 12; x - 6$

6	1	-3	-16	-12
	↓	6	18	12
	1	3	2	0

$(x-6)(x^2+3x+2)$

$\boxed{(x-6)(x+2)(x+1)}$

A polynomial f and one zero of f are given. Factor the other zeros of f.

8) $f(x) = 2x^3 + 3x^2 - 39x - 20; 4$

4	2	3	-39	-20
	↓	8	44	20
	2	11	5	0

$2x^2+11x+5$

$(2x+1)(x+5)=0$

$\boxed{x=4, -\frac{1}{2}, -5}$

List the possible rational zeros of the function. What is the maximum number of zeros the function has?

9) $f(x) = x^4 - 6x^3 + 8x^2 - 21$

$\boxed{\frac{p}{q} = \pm 1, \pm 3, \pm 7, \pm 21}$ $\boxed{4 \text{ zeros}}$

10) $g(x) = 9x^5 + 3x^3 + 7x - 4$

$p = \pm 1, \pm 2, \pm 4$

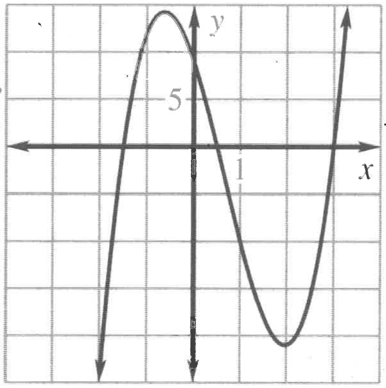
$q = \pm 1, \pm 3, \pm 9$

$\boxed{\frac{p}{q} = \pm 1, \pm 2, \pm 4, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{1}{9}, \pm \frac{2}{9}, \pm \frac{4}{9}}$

$\boxed{5 \text{ zeros}}$

Use the graph to shorten the list of possible rational zeros of f. Then find all real zeros of f.

11) $f(x) = 4x^3 - 8x^2 - 15x + 9$



$$\begin{array}{r|rrrr} 3 & 4 & -8 & -15 & 9 \\ & & 12 & 12 & -9 \\ \hline & 4 & 4 & -3 & \boxed{0} \end{array}$$

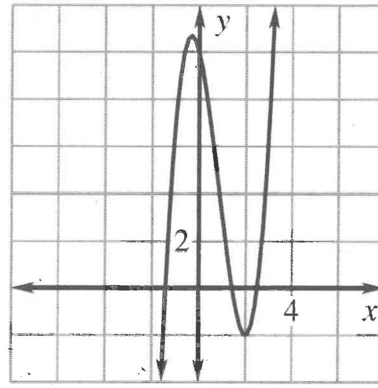
$4x^2+4x-3=0$

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

$x=\frac{1}{2}, -\frac{3}{2}$

$\boxed{x=3, \frac{1}{2}, -\frac{3}{2}}$

12) $f(x) = 2x^3 - 5x^2 - 4x + 10$



$\underbrace{2x^3-5x^2}\underbrace{-4x+10}$

$x^2(2x-5)-2(2x-5)$

$(x^2-2)(2x-5)=0$

$x^2=2 \quad x=\frac{5}{2}$

$x=\pm\sqrt{2}$

$\boxed{x=\frac{5}{2}, \pm\sqrt{2}}$

Find all zeros of the polynomial function.

13) $f(x) = x^3 - x^2 - 11x + 3$

$$\begin{array}{r|rrrr} -3 & 1 & -1 & -11 & 3 \\ & \downarrow & -3 & 12 & -3 \\ \hline & 1 & -4 & 1 & \boxed{0} \end{array}$$

$x^2-4x+1=0$

$x=\frac{4\pm\sqrt{16-4(1)(1)}}{2(1)}=\frac{4\pm\sqrt{12}}{2}=\frac{4\pm2\sqrt{3}}{2}$

$\boxed{x=-3, 2\pm\sqrt{3}}$

14) $h(x) = 2x^4 + x^3 + x^2 + x - 1$

$$\begin{array}{r|rrrrr} -1 & 2 & 1 & 1 & 1 & -1 \\ & \downarrow & -2 & 1 & -2 & 1 \\ \hline & 2 & -1 & 2 & -1 & \boxed{0} \end{array}$$

$\underbrace{2x^3-x^2}\underbrace{+2x-1}=0$

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

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

$x=\frac{1}{2} \quad x^2=-1 \quad x=\pm i$

$\boxed{x=-1, \frac{1}{2}, \pm i}$

Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

15) $-7, -4$

$\boxed{f(x)=(x+7)(x+4)}$

16) $1, 2, 5$

$\boxed{f(x)=(x-1)(x-2)(x-5)}$

17) $-3, 0, 1$

$\boxed{f(x)=(x+3)(x)(x-1)}$

18) $4, i, -1$

$\boxed{f(x)=(x-4)(x-i)(x+i)(x+1)}$

19) $-5, 0, -2i$

$\boxed{f(x)=(x+5)(x)(x+2i)(x-2i)}$

20) $-1, 2+\sqrt{3}, 5-i$

$\boxed{f(x)=(x+1)(x-(2+\sqrt{3}))(x-(2-\sqrt{3}))(x-(5-i))(x-(5+i))}$