Algebra 2
Finding Zeros Using Synthetic Division

Name: KEY

Date: _____ Per: ___

Find the remaining zeros of the polynomial functions. One factor has been given.

1. $f(x) = 2x^3 + 5x^2 - 28x - 15;\ x + 5$

-5	2	5	-28	-15
	↓	-10	25	15
	2	-5	-3	0

$-6 \times 1 = -6$, $-6 + 1 = -5$

$2x^2 - 5x - 3 = 0$

$(2x^2 - 6x) + (x - 3) = 0$

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

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

$x = -5$ $x = 3$ $x = -1/2$

2. $f(x) = x^3 - x^2 - 14x + 24;\ x - 3$

3	1	-1	-14	24
	↓	3	6	-24
	1	2	-8	0

$-8 \times 1 = -8$, $4 + (-2) = 2$

$x^2 + 2x - 8 = 0$

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

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

3. $f(x) = x^4 + 3x^3 - 13x^2 - 15x;\ x - 3$

3	1	3	-13	-15
		3	18	15
	1	6	5	0

$x^3 + 6x^2 + 5x = 0$

$5 \times 1 = 5$, $5 + 1 = 6$

$x(x^2 + 6x + 5) = 0$

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

$x = 0$ $x + 5 = 0$ $x + 1 = 0$

$x = 3$ $x = 0$ $x = -5$ $x = -1$

4. $f(x) = x^3 - 12x^2 + 47x - 60;\ x - 3$

3	1	-12	47	-60
		3	-27	60
	1	-9	20	0

$x^2 - 9x + 20 = 0$

$-5 \times -4 = 20$, $-5 + (-4) = -9$

$(x-5)(x-4) = 0$

$x = 3$ $x = 5$ $x = 4$

5. $f(x) = x^3 - 7x^2 + 2x + 40;\ x - 5$

5	1	-7	2	40
		5	-10	-40
	1	-2	-8	0

$x^2 - 2x - 8 = 0$

$-4 \times 2 = -8$, $-4 + 2 = -2$

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

$x = 5$ $x = 4$ $x = -2$

6. $f(x) = x^3 - 3x^2 - 9x + 27;\ x - 3$

3	1	-3	-9	27
		3	0	-27
	1	0	-9	0

$x^2 + 0x - 9 = 0$

$x^2 - 9 = 0$

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

$x = 3$ $x = -3$ $x = 3$

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Find the roots of the functions, where one root has been given.

7. $f(x) = 10x^3 + 37x^2 + 37x + 6;\ x = -2$

-2	10	37	37	6
	↓	-20	-34	-6
	10	17	3	0

$10x^2 + 17x + 3 = 0$

$(10x^2 + 15x)(+2x + 3) = 0$

$5x(2x + 3) + 1(2x + 3) = 0$

$(2x + 3)(5x + 1) = 0$

$2x + 3 = 0 \qquad 5x + 1 = 0$

$\boxed{x = -3/2} \qquad \boxed{x = -1/5}$

8. $f(x) = 25x^3 + 150x^2 + 131x + 30;\ x = -5$

-5	25	150	131	30
		-125	-125	-30
	25	25	6	0

$25x^2 + 25x + 6 = 0$

$(25x^2 + 15x) + (10x + 6) = 0$

$5x(5x + 3) + 2(5x + 3) = 0$

$(5x + 3)(5x + 2) = 0$

$5x + 3 = 0 \qquad 5x + 2 = 0$

$\boxed{x = -3/5} \qquad \boxed{x = -2/5}$

9. $f(x) = 5x^3 + 21x^2 - 21x - 5;\ x = -5$

-5	5	21	-21	-5
		-25	20	5
	5	-4	-1	0

$5x^2 - 4x - 1 = 0$

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

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

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

$x - 1 = 0 \qquad 5x + 1 = 0$

$\boxed{x = 1} \qquad \boxed{x = -1/5}$

10. $f(x) = 3x^3 - 4x^2 - 9x + 10;\ x = 2$

2	3	-4	-9	10
		6	4	-10
	3	2	-5	0

$3x^2 + 2x - 5 = 0$

$(3x^2 + 5x)(-3x - 5) = 0$

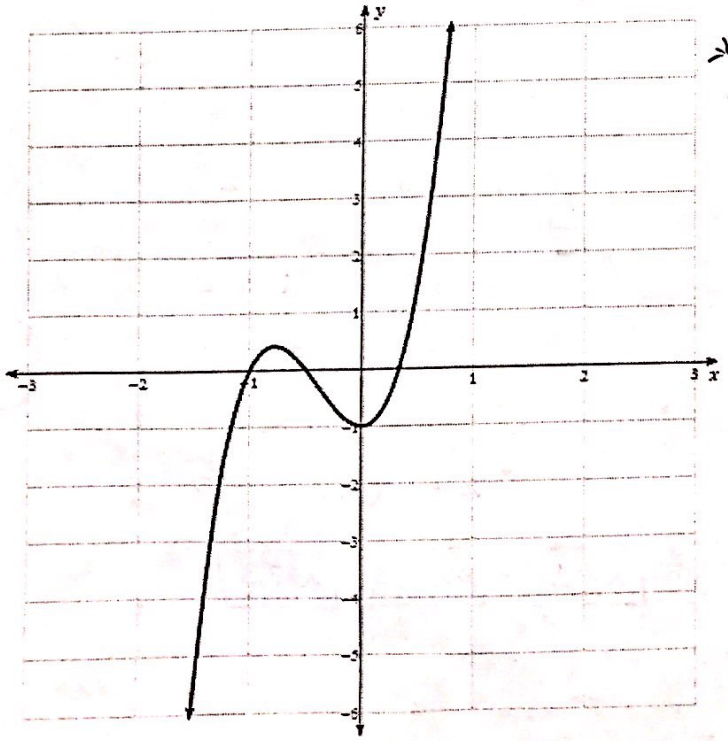
$x(3x + 5) - 1(3x + 5) = 0$

$(3x + 5)(x - 1) = 0$

$3x + 5 = 0 \qquad x - 1 = 0$

$\boxed{x = -5/3} \qquad \boxed{x = 1}$

11. Use synthetic division to find the EXACT zeros of the function $f(x) = 6x^3 + 7x^2 - 1$ graphed below.



-1	6	7	0	-1
		-6	-1	1
	6	1	-1	0

$6x^2 + x - 1 = 0$

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

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

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

$2x + 1 = 0 \qquad 3x - 1 = 0$

$x = -1/2 \qquad x = 1/3$

Exact Zeros: $-1,\ -1/2,\ 1/3$

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