13. $f(x) = 12x^3 + 8x^2 - 13x + 3$; ½

½ | 12 8 -13 3
6 7 -3
12 14 -6 | 0

$12x^2 + 14x - 6 = 0$
$2(6x^2 + 7x - 3) = 0$
$2(3x - 1)(2x + 3)$
$x = 1/2, 1/3, -3/2$

14. $f(x) = 2x^3 + 11x^2 + 9x + 2$; -½

-½ | 2 11 9 2
-1 -5 -2
2 10 4 | 0

$2x^2 + 10x + 4 = 0$
$2(x^2 + 5x + 2) = 0$
$x = \frac{-5 \pm \sqrt{25 - 4(1)(2)}}{2} = \frac{-5 \pm \sqrt{17}}{2}$

$-1/2, \frac{-5 \pm \sqrt{17}}{2}$

Find all of the zeros of the polynomial function. SHOW ALL WORK!

15. $f(x) = x^4 + 5x^3 + 5x^2 - 5x - 6$

1 | 1 5 5 -5 -6
1 6 11 6
-1 | 1 6 11 6 | 0
-1 -5 -6
1 5 6 | 0

$x^2 + 5x + 6 = 0$
$(x + 2)(x + 3) = 0$
$x = \{\pm 1, -2, -3\}$

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

$x = 1, \pm 3$

1 | 1 -1 -9 9
1 0 -9
1 0 -9 | 0

$x^2 - 9 = 0$
$x = \pm 3$

17. $f(x) = 2x^3 - 5x^2 - 4x + 10$ $\{5/2, \pm\sqrt{2}\}$

5/2 | 2 -5 -4 10
-5 0 -10
2 0 -4 | 0

$2x^2 - 4 = 0$
$2x^2 = 4$
$x^2 = 2$
$x = \pm\sqrt{2}$

18. $f(x) = 3x^3 - x^2 - 12x + 4$ $\{1/3, \pm 2\}$

1/3 | 3 -1 -12 4
1 0 -4
3 0 -12 | 0

$3x^2 - 12 = 0$
$3x^2 = 12$
$x^2 = 4$
$x = \pm 2$

Algebra 2
WS: 4.5 Extra Practice

Name Key
Date 1/12 Block 3A

List the possible rational roots of f using the rational root theorem.

1. $f(x) = x^4 - 2x^3 + 3x - 4$

$\pm 1, \pm 2, \pm 4$

2. $f(x) = 3x^5 + 2x + 8$

$\pm 1, \pm 2, \pm 4, \pm 8, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{8}{3}$

3. $f(x) = x^4 + 2x^2 - 24$

$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$

4. $f(x) = 8x^2 - 12x - 3$

$\pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{4}, \pm \frac{3}{4}, \pm \frac{1}{8}, \pm \frac{3}{8}$

5. $f(x) = 6x^4 - 3x^3 + x + 10$

$\pm \frac{1}{6}, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm 1, \pm 2, \pm \frac{2}{3}, \pm 5, \pm \frac{5}{6}, \pm \frac{5}{2}, \pm \frac{5}{3}, \pm 10, \pm \frac{10}{3}$

6. $f(x) = 4x^3 + 5x^2 - 3$

$\pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{1}{4}, \pm \frac{3}{2}, \pm \frac{3}{4}$

Determine whether the given x-value is a zero of the function.

7. $f(x) = x^4 + 2x^3 + 5x^2 + 8x + 4, x = -1$

$-1 \mid 1 \quad 2 \quad 5 \quad 8 \quad 4$
$\quad\quad -1 \quad -1 \quad -4 \quad -4$
$\quad 1 \quad 1 \quad 4 \quad 4 \mid 0$

yes

8. $f(x) = x^4 - x^3 - 8x^2 + 2x + 12, x = -2$

yes

$-2 \mid 1 \quad -1 \quad -8 \quad 2 \quad 12$
$\quad\quad -2 \quad 6 \quad 4 \quad -12$
$\quad 1 \quad -3 \quad -2 \quad 6 \mid 0$

9. $f(x) = x^3 + 4x^2 + x + 4, x = -1$

No

$-1 \mid 1 \quad 4 \quad 1 \quad 4$
$\quad\quad -1 \quad -3 \quad 2$
$\quad 1 \quad 3 \quad -2 \mid 6$

10. $f(x) = 2x^3 - x^2 + 8x - 4, x = \frac{1}{2}$

yes

$\frac{1}{2} \mid 2 \quad -1 \quad 8 \quad -4$
$\quad\quad 1 \quad 0 \quad 4$
$\quad 2 \quad 0 \quad 8 \mid 0$

Given one zero of the polynomial function, find the other zeros.

11. $f(x) = x^3 - 8x^2 + 5x + 14; 2$

$2 \mid 1 \quad -8 \quad 5 \quad 14$
$\quad\quad 2 \quad -12 \quad -14$
$\quad 1 \quad -6 \quad -7 \mid 0$

$x^2 - 6x - 7 = 0$

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

$x = 7, -1$

Zeros
2, 7, -1

12. $f(x) = x^3 + x^2 - 13x + 3; 3$

Zeros
$3, -2 \pm \sqrt{5}$

$3 \mid 1 \quad 1 \quad -13 \quad 3$
$\quad\quad 3 \quad 12 \quad -3$
$\quad 1 \quad 4 \quad -1 \mid 0$

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

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

$x = \frac{-4 \pm 2\sqrt{5}}{2} = -2 \pm \sqrt{5}$