Name:_____

8.5 Finding Zeros Day 2

1. Given that 3 is a zero of the polynomial $P(x)=x^3+2x^2-11x-12$, factor completely

3 | 1 2 -11 -12
↓ 3 15 12
1 5 4 | 0

$(x-3)(x^2+5x+4)$

$\boxed{(x-3)(x+4)(x+1)}$

2. Given that 2 is a zero of the polynomial $P(x)=x^3-4x^2-11x+30$, factor completely

2 | 1 -4 -11 30
↓ 2 -4 -30
1 -2 -15 | 0

$(x-2)(x^2-2x-15)$

$\boxed{(x-2)(x-5)(x+3)}$

List all possible rational zeros given by the Rational Zeros Theorem (but don't check to see which actually are zeros)

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

P: ±1, ±3

Q: ±1

$\frac{P}{Q}$: $\boxed{\pm\{1,3\}}$

4. $P(x)=6x^4-x^2+2x+12$

P: ±1, ±2, ±3, ±4, ±6, ±12

Q: ±1, ±2, ±3, ±6

$\frac{P}{Q}$: $\boxed{\pm\{1,2,3,4,6,12,\frac{1}{2},\frac{1}{3},\frac{1}{6},\frac{2}{3},\frac{3}{2},\frac{4}{3}\}}$

Factor Completely

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

P: ±1, ±2, ±4

Q: ±1

possible: $\pm\{1,2,4\}$

1 | 1 3 0 -4
↓ 1 4 4
1 4 4 | 0

$(x-1)(x^2+4x+4)$

2, 4

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

6. $P(x)=x^3-3x-2$

P: ±1, ±2

Q: ±1

possible: $\pm\{1,2\}$

1 | 1 0 -3 -2
↓ 1 1 -2
1 1 -2 | -4

2 | 1 0 -3 -2
↓ 2 4 2
1 2 1 | 0

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

1, 1, 2

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

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

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

P: ±1, ±2, ±3, ±6

Q: ±1

possible: $\pm\{1,2,3,6\}$

1 | 1 -2 -5 6
↓ 1 -1 -6
1 -1 -6 | 0

$x(x-1)(x^2-x-6)$

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

Find all real zeros of the polynomial. Use the quadratic formula if necessary

8. $P(x)=x^3+4x^2+3x-2$

P: ±1, ±2

Q: ±1

possible: $\pm\{1,2\}$

1 | 1 4 3 -2
↓ 1 5 8
1 5 8 | 6

-1 | 1 4 3 -2
↓ -1 -3 0
1 3 0 | -2 Nooo...

2 | 1 4 3 -2
↓ 2 12 30
1 6 15 | 28 why me...

-2 | 1 4 3 -2
↓ -2 -4 2
1 2 -1 | 0 FINALLY

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

doesn't factor...

a=1 b=2 c=-1

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

$=\frac{-2\pm\sqrt{8}}{2}=-1\pm\sqrt{2}$

$\boxed{\{-2,-1\pm\sqrt{2}\}}$

9. $P(x)=x^4-5x^3-5x^2+23x+10$

P: ±1, ±2, ±5, ±10

Q: ±1

possible: $\pm\{1,2,5,10\}$

5 | 1 -5 -5 23 10
↓ 5 0 -25 -10
1 0 -5 -2 | 0

$(x-5)(x^3-5x-2)$

use rational roots again

P: ±1, ±2

Q: ±1

-2 | 1 0 -5 -2
↓ -2 4 2
1 -2 -1 | 0

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

Quad Form

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

$=\frac{2\pm\sqrt{8}}{2}=1\pm\sqrt{2}$

$\boxed{\{5,-2,1\pm\sqrt{2}\}}$