

Name: Key → Answers Only

Date: _____

Find all of the **linear factors** given one factor(s):

1. $f(x) = x^3 + 9x^2 + 23x + 15$; $(x+5)$
 $x = -5$

$$\begin{array}{r} -5 \overline{) 1 \ 9 \ 23 \ 15} \\ \underline{\downarrow -5 \ -20 \ -15} \\ 1 \ 4 \ 3 \ 0 \end{array}$$

$x^2 + 4x + 3 = 0$
 $(x+3)(x+1)$

Factors: $(x+5)(x+3)(x+1)$

2. $f(x) = 3x^3 + 4x^2 - 35x - 12$; $(x-3)$

Factors: $(x-3)(x+4)(3x+1)$

3. $f(x) = 3x^4 - 10x^3 - 24x^2 - 6x + 5$;
 $(x+1)$ and $(x-5)$

4. $f(x) = x^4 - 4x^3 - 20x^2 + 48x$;
 $(x+4)$ and $(x-2)$

Factors: $(x+1)(x-5)(3x-1)(x+1)$

Factors: $(x+4)(x-2)(x)(x-6)$

Find all of the **zeros** given one or more zeros:

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

$$\begin{array}{r} -3 \overline{) 4 \ 12 \ -1 \ -3} \\ \underline{\downarrow -12 \ 0 \ 3} \\ 4 \ 0 \ -1 \ 0 \end{array}$$

$4x^2 - 1 = 0$
 $(2x+1)(2x-1) = 0$
 $2x+1=0 \quad 2x-1=0$

Zeros:
 -3
 $1/2$
 $-1/2$

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

Zeros:
 -1
 0
 $1/3$

Find all of the roots by factoring:

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

* Grouping *

$x = 0, 2, \pm\sqrt{3}$

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

* Grouping *

$x = -5, \pm i$

9. $f(x) = 2x^4 - x^3 - 18x^2 + 9x$

* Grouping *

$x = 0, \pm 3, \frac{1}{2}$

10. $f(x) = x^4 - 6x^2 + 8$

* Higher Degree *

$x = \pm 2, \pm\sqrt{2}$

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

* Grouping *

$x = 1, \pm i$

12. $f(x) = x^3 + 8$

* SOAP *

$x = -2, 1 \pm i\sqrt{3}$