

Determine if the following can be factored (or rewritten) so that it contains a quadratic (*yes* or *no*).

- 1) Yes $x^{22} - 3x^{11} - 18$ 2) No $8y^{3/7} + 5y^{3/49} - 12$ 3) Yes $r^5 + 7r^3$
GCF! $r^3(r^2+7)$

Solve each equation by *first* factoring it.

4) $8h^3 - 125 = 0$
 $(2h-5)(4h^2+10h+25) = 0$
 $h = \frac{5}{2}, h = -1.3 \pm 2.2i$
or
 $\frac{-5 \pm 5i\sqrt{3}}{4}$

5) $x^5 - 13x^3 + 40x = 0$
 $x(x^4 - 13x^2 + 40) = 0$
 $x(x^2 - 8)(x^2 - 5) = 0$
 $x = 0, x = \pm 2.8, x = \pm 2.2$
or or
 $\pm 2\sqrt{2}$ $\pm \sqrt{5}$

6) $2y^4 - 3y^2 - 5 = 0$
 $(2y^2 - 5)(y^2 + 1) = 0$
 $y = \pm 1.6, y = \pm i$
or
 $\pm \frac{5\sqrt{2}}{2}$

7) $x^3 - 3x^2 - 4x + 12 = 0$
 $x^2(x-3) - 4(x-3) = 0$
 $(x-3)(x^2-4) = 0$
 $x = 3, x = \pm 2$

Given an imaginary root, according to the Complex Conjugates Theorem, give one other root that must exist.

- 8) $2 - 14i$, $2 + 14i$ 9) $-1 + 3i$, $-1 - 3i$ 10) $-10i$, $10i$

Write a polynomial function of least degree that has the following roots.

11) roots: 1, 6, -2
 $f(x) = (x-1)(x-6)(x+2)$
 $= (x^2 - 7x - 6)(x+2)$

	x^2	$-7x$	-6
x	x^3	$-7x^2$	$-6x$
2	$2x^2$	$-14x$	12

$f(x) = x^3 - 5x^2 - 8x + 12$

12) roots: 5 and $-4i$... and $+4i$
 $f(x) = (x-5)(x+4i)(x-4i)$
 $x^2 - 16i^2$
 $= (x-5)(x^2 + 16)$
 $f(x) = x^3 - 5x^2 + 16x - 80$

For each function, create a list of possible rational zeros.

13) $f(x) = x^4 + 7x^3 - 3x - 28$

p: $\pm 1, 2, 4, 7, 14, 28$

q: ± 1

p/q: $\pm 1, 2, 4, 7, 14, 28$

14) $g(x) = 4x^3 - 4x^2 + x + 25$

p: $\pm 1, 5, 25$

q: $\pm 1, 2, 4$

p/q: $\pm 1, 5, 25, \frac{1}{2}, \frac{5}{2}, \frac{25}{2}, \frac{1}{4}, \frac{5}{4}, \frac{25}{4}$

Find all the zeros for each of the following functions. You may want to create a p&q list, and you must show proof!

15) $f(x) = 2x^4 + 7x^3 - 2x^2 - 19x - 12$

p: $\pm 1, 2, 3, 4, 6, 12$

q: $\pm 1, 2$

p/q: $\pm 1, 2, 3, 6, 4, 12, \frac{1}{2}, \frac{3}{2}$

$$\begin{array}{r|rrrrr} \boxed{-1} & 2 & 7 & -2 & -19 & -12 \\ & & -2 & -5 & 7 & 12 \\ \hline \end{array}$$

$$\begin{array}{r|rrrrr} \boxed{-3} & 2 & 5 & -7 & -12 & 0 \\ & & -6 & 3 & 12 & \\ \hline \end{array}$$

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

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

run program

$x = -1, -3, 1.7, -1.2$

16) $g(x) = x^4 + 6x^2 + 20x$

$x(x^3 + 6x + 20) = 0$

$x = 0$

p/q: $\pm 1, 2, 4, 5, 10, 20$

$$\begin{array}{r|rrrr} \boxed{-2} & 1 & 0 & 6 & 20 \\ & & -2 & 4 & -20 \\ \hline & 1 & -2 & 10 & 0 \end{array}$$

$x^2 - 2x + 10 = 0$

run program

$x = 0, -2, 1 \pm 3i$

