SECTION 6-4 ROOTS & ZEROS

Review: Find all the zeros of the following functions by factoring. First, determine how many zeros (roots or solutions) you are looking for.

1) $f(h) = h^3 - 8000$
\# of zeros: 3

$(h - 20)(h^2 + 20h + 400) = 0$
h = 20, apply the quadratic formula
$h = -10 \pm 10i\sqrt{3}$
or with the program
$h = -10 \pm 17.3i$

2) $f(x) = 2x^4 + 5x^2 - 63$ # of zeros: 4

$(2x^2 - 9)(x^2 + 7) = 0$
$2x^2 - 9 = 0$ and $x^2 + 7 = 0$ ← or run prog-ram
$2x^2 = 9$ $x^2 = -7$
$x^2 = 9/2$
$x = \sqrt{\frac{9}{2}}$ $x = \sqrt{-7}$
$x = \pm\frac{3\sqrt{2}}{2}$ $x = \pm i\sqrt{7}$

The downfall of section 6-8. Find all the zeros for the following function: $f(x) = x^5 + 3x^2 - 18$

can't factor it, there must be another way…stay tuned

COMPLEX CONJUGATES THEOREM:

For every complex root that exists there is a matching conjugate root that also exists.

Examples:

1) Root: $12 - 3i$, $12 + 3i$

2) Root: $-3 + 8i$ $-3 - 8i$

3) Root: $5+3i\sqrt{2}$ $5 - 3i\sqrt{2}$

4) Root: $-7i$ $0 + 7i$ or just $7i$

Write a polynomial function of least degree that has the given zeros.

1) zeros: 3, -2, -1

$f(x) = (x - 3)(x + 2)(x + 1)$
FOIL: $f(x) = (x^2 - x - 6)(x + 1)$
BOX: $f(x) = x^3 - 7x - 6$

2) zeros: ±5, 2, 0

$f(x) = x(x - 5)(x + 5)(x - 2)$
DIST: $x(x - 2)$ $f(x) = (x^2 - 2x)(x - 5)(x + 5)$
FOIL: $(x - 5)(x + 5)$ $f(x) = (x^2 - 2x)(x^2 - 25)$
FOIL: $(x^2 - 2x)(x^2 - 25)$ $f(x) = x^4 - 2x^3 - 25x^2 + 50x$

3) zeros: ±6, 3i -3i is automatically the 4th root

$f(x) = (x - 6)(x + 6)(x - 3i)(x + 3i)$
FOIL: $(x - 6)(x + 6)$ & FOIL: $(x - 3i)(x + 3i)$
$(x^2 - 36)$ $(x^2 + 9)$
FOIL TOGETHER: $(x^2 - 36)(x^2 + 9)$
$f(x) = x^4 - 27x^2 - 324$

4) zeros: 1, 2 + i 2 – I is automatically the 3rd root

$f(x) = (x - 1)[x - (2 + i)][x - (2 - i)]$
$f(x) = (x - 1)(x - 2 - i)(x - 2 + i)$
BOX: $(x - 2 - i)(x - 2 + i)$
$f(x) = (x - 1)(x^2 - 4x + 5)$ BOX again:
$f(x) = x^3 - 5x^2 + 9x - 5$