Find all of the real zeros of the function, finding exact values whenever possible. Identify each zero as rational or irrational.

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

$$\begin{array}{c|cccc} 4 & 1 & -6 & 7 & 4 \\ & & 4 & -8 & -4 \\ \hline & 1 & -2 & -1 & 0 \end{array}$$

$x = 4$ Rational

$x = 1 \pm \frac{\sqrt{8}}{2}$ → Irrational

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

$\frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$

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

$1 \pm \frac{\sqrt{4+4}}{2}$

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

Find all of the real zeros of the function, finding exact values whenever possible. Identify each zero as rational or irrational.

$f(x) = 2x^4 - 7x^3 - 8x^2 + 14x + 8$

p (8) $\pm 1, \pm 2, \pm 4, \pm 8$

q (2) $\pm 1, \pm 2$

$\frac{p}{q} = \pm 1, \pm 2, \pm 4, \pm 8, \pm \frac{1}{2}$

$$\begin{array}{c|ccccc} 4 & 2 & -7 & -8 & 14 & 8 \\ & & 8 & 4 & -16 & -8 \\ \hline -\frac{1}{2} & 2 & 1 & -4 & -2 & 0 \\ & & -1 & 0 & 2 & \\ \hline & 2 & 0 & -4 & 0 & \end{array}$$

$x = -\frac{1}{2}, 4$ Rational

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

$2x^2 - 4 = 0$

$+4 \quad +4$

$\frac{2x^2}{2} = \frac{4}{2}$

$x^2 = 2$

$x = \pm\sqrt{2}$

HW problem #55 is a good lead in to section 2.5

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

4 | $2 \quad -7 \quad -2 \quad -7 \quad -4$

$\quad\quad\quad 8 \quad 4 \quad 8 \quad 4$

$\quad 2 \quad 1 \quad 2 \quad 1 \quad | \; 0$

$-\frac{1}{2}$ | $\quad\quad -1 \quad 0 \quad -1$

$\quad 2 \quad 0 \quad 2 \quad 0$

$x = 4, -\frac{1}{2}$ Rational

$2x^2 + 2 = 0$

$2x^2 = -2$

$x^2 = -1$

$x = \pm\sqrt{-1}$

$\sqrt{-1} = i$

What you'll Learn About

$i = \sqrt{-1}$

$i^2 = -1$

Write the polynomial in standard form, and identify the zeros of the function and the x-intercepts.

a) $(x - 4i)(x + 4i)$

$x^2 + 4ix - 4ix - 16i^2$

$x^2 - 16(-1)$

$x^2 + 16$

$x - 4i = 0$ $\quad +4i \quad +4i$

$x + 4i = 0$

$-4i \quad -4i$

Zeros $x = \pm 4i$

x-intercepts None

b) $(x - 3)(x - \sqrt{4}i)(x + \sqrt{4}i)$

$(x-3)(x-2i)(x+2i)$

$(x-3)(x^2 - 2ix + 2ix - 4i^2)$

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

$x^3 - 3x^2 + 4x - 12$

$x - 3 = 0$

$x = 3$

$x - \sqrt{4}i = 0$

$x = \sqrt{4}i$

$= 2i$

$x + \sqrt{4}i = 0$

$x = -\sqrt{4}i$

$-2i$

Zeros $3, \pm 2i$

x-intercept 3

c) $x(x - 3)(x - 2 - i)(x - 2 + i)$

$x = 0 \quad x - 3 = 0 \quad x - 2 - i = 0 \quad x - 2 + i = 0$

$x = 0 \quad x = 3 \quad x = 2 + i \quad x = 2 - i$

Zeros $x = 0, 3, 2 \pm i$

x-intercepts $0, 3$

Conjugate

Write a polynomial function of minimum degree in standard form with real coefficients whose zeros include those listed.

$i^2 = -1$

a) 2, 5i, and -6i

$2, 5i, -5i, 6i, -6i$

$(x-2)(x-5i)(x+5i)(x-6i)(x+6i)$

$(x-2)(x^2+25)(x^2+36)$

$(x-2)(x^4+61x^2+900)$

$x^5 + 61x^3 + 900x$

$-2x^4 \quad -122x^2 \quad -1800$

$x^5 - 2x^4 + 61x^3 - 122x^2 + 900x - 1800$

b) -2, 3, and 2 – i

c) -4, 2 + 3i

	Write a polynomial function of minimum degree in standard form with real coefficients whose zeros and their multiplicities include those listed. Then sketch a graph and discuss what you notice. a) 3 (multiplicity 2), - 4 (multiplicity 3) b) 3 (multiplicity 3), - 4 (multiplicity 1) c) 5 (multiplicity 2), $2 + i$ (multiplicity 1)

	Find all of the zeros and write a linear factorization of the function 28) $f(x) = x^3 - 10x^2 + 44x - 69$ A) $f(x) = x^5 - 3x^4 - 5x^3 + 5x^2 - 6x + 8$