

Algebra 2 Worksheet

Section 6.6 - Fundamental Theorem of Algebra DAY TWO

Name: Jay

I. Write the simplest polynomial function (in standard form) with the following zeros.

1. $3i$ and -5

$$-3i$$

$$(x) = (\pm 3)^2$$

$$x^2 = 9i^2$$

$$x^2 = -9$$

$$x^2 + 9 = 0$$

$$x = -5$$

$$x + 5 = 0$$

2. $-2i$ and $\sqrt{2}$

$$+2i \quad -\sqrt{2}$$

$$(x) = (\pm 2i)^2$$

$$x^2 = 4i^2$$

$$x^2 = -4$$

$$x^2 + 4 = 0$$

$$(x) = (\pm \sqrt{2})^2$$

$$x^2 = 2$$

$$x^2 - 2 = 0$$

$$P(x) = (x+5)(x^2 + 9)$$

$$\boxed{P(x) = x^3 + 5x^2 + 9x + 45}$$

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

$$\boxed{P(x) = x^4 + 2x^2 - 8}$$

II. Solve each equation by finding all the roots (EXACT VALUE). Use the calculator to help you.

3. $x^3 - 7x^2 + 15x - 9 = 0$

roots @ -1 and 3

\uparrow
double root

4. $14x^4 - 43x^3 + 14x^2 + 15x = 0$ CAREFUL! GCF!

$$x(\underbrace{14x^3 - 43x^2 + 14x + 15}_0) = 0$$

0 is a root into calc. : 1 is a root

$$\begin{array}{r} 11 \ 14 \ -43 \ 14 \ | \ 15 \\ \downarrow \ 14 \ \ 14 \ -29 \ | \ -15 \\ 14 \ -29 \ -15 \ 0 \end{array}$$

$$14x^2 - 29x - 15 = 0$$

$$\text{mult} = -210$$

$$\text{add} = -29 \quad -35 \text{ and } 6$$

$$(2x - 5)(7x + 3) = 0$$

$$2x - 5 = 0 \quad 7x + 3 = 0$$

$$x = \frac{5}{2} \quad x = -\frac{3}{7}$$

$$\boxed{x = 0, 1, \frac{5}{2}, -\frac{3}{7}}$$

$$\boxed{x = -1, 3}$$

$$5. x^4 - 3x^3 + 5x^2 = 27x + 36$$

$$x^4 - 3x^3 + 5x^2 - 27x - 36 = 0$$

from calc: roots @ 4 and -1

$$\begin{array}{r} 4) \end{array} \begin{array}{r} 1 & -3 & 5 & -27 & | -36 \\ \hline 1 & 1 & 9 & +9 & | 0 \end{array}$$

$$\begin{array}{r} 1) \end{array} \begin{array}{r} 1 & 1 & 9 & | 9 \\ \hline 1 & 0 & 9 & | 0 \end{array}$$

$$x^2 + 9 = 0$$

$$\sqrt{x^2} = \pm 3$$

$$x = \pm 3i$$

$$x = -1, 4, \pm 3i$$

$$6. x^3 - 2x = 2x^2 + 3$$

$$x^3 - 2x^2 - 2x - 3 = 0$$

from calc: root @ 3

$$\begin{array}{r} 3) \end{array} \begin{array}{r} 1 & -2 & -2 & | -3 \\ \hline 1 & 1 & 1 & | 0 \end{array}$$



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

$$a = 1 \quad b = 1 \quad c = 1$$

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

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

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

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

III. Graphing Calculator.

7. Consider the polynomial function $f(x) = 3x^4 + 40x^3 + 96x^2 + 144x - 715$.

(a) Use the Rational Root Theorem to list the possible rational roots of this equation.

$$P: \pm 1, \pm 5, \pm 11, \pm 13, \pm 55, \pm 65, \pm 143, \pm 715$$

$$Q: \pm 1, \pm 3$$

$$\Rightarrow \frac{P}{Q}: \pm 1, \pm 5, \pm 11, \pm 13, \pm 55, \pm 65, \pm 143, \pm 715, \pm \frac{1}{3}, \pm \frac{5}{3}, \pm \frac{11}{3}, \pm \frac{13}{3}, \pm \frac{55}{3}, \pm \frac{65}{3}$$

(b) Graph the polynomial on a graphing calculator. Which possible rational roots are zeros of $f(x)$? How do you know?

$$-11, \frac{5}{3}$$

x-int of function

(c) According to the graph, how many other real zeros does the function have?

$$\boxed{\text{none}}$$

(d) How many imaginary zeros does the function have?

$$\boxed{2}$$

(4 total roots \rightarrow 2 real \rightarrow 2 imag)

(e) Find the imaginary zeros. SHOW YOUR WORK.

$$\begin{array}{r} 1) \end{array} \begin{array}{r} 3 & 40 & 96 & 144 & | -715 \\ \hline 3 & 7 & 19 & -65 & | 0 \end{array}$$

$$\begin{array}{r} 3) \end{array} \begin{array}{r} 3 & 7 & 19 & | -65 \\ \hline 3 & 12 & 39 & | 0 \end{array}$$

$$3x^2 + 12x + 39 = 0$$

$$x^2 + 4x + 13 = 0$$

$$x = -4 \pm \sqrt{16 - 4(13)}$$

$$x = -4 \pm \frac{\sqrt{-36}}{2}$$

$$x = \frac{-4 \pm \sqrt{-60}}{2}$$

$$x = -2 \pm 3i$$