Kuta Software - Infinite Algebra 2 Name Key

Analyzing and Solving Polynomial Equations

Date_____ Period____

State the number of complex roots, the possible number of real and imaginary roots, the possible number of positive and negative roots, and the possible rational roots for each equation. Then find all roots.

1) $x^4 - 5x^2 - 36 = 0$ ★Treat like a Quad.★

$(x^2-9)(x^2+4)=0$

$x^2-9=0 \quad x^2+4=0$

$\sqrt{x^2}=\sqrt{9} \quad \sqrt{x^2}=\sqrt{-4}$

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

$\{\pm 3, \pm 2i\}$

2) $x^3 + 3x^2 - 14x - 20 = 0$

$x^2(x+3) - 2(7x+5)$ ★can't factor - graph!

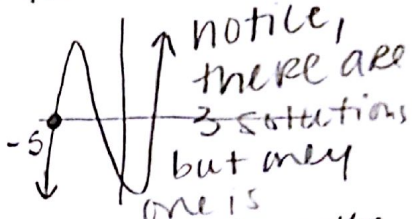
	1	3	-14	-20
-5		-5	10	20
	1	-2	-4	0

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

$\left(\frac{-2}{2}\right)^2 = (-1)^2 = 1$

$x^2 - 2x + 1 = 4 + 1$

$(x-1)^2 = 5$



$\sqrt{(x-1)^2} = \sqrt{5}$

$x-1 = \pm\sqrt{5}$

$x = 1 \pm \sqrt{5}$

$\{-5, 1 \pm \sqrt{5}\}$

3) $x^3 - 2x^2 + 3x - 6 = 0$

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

$(x^2+3)(x-2) = 0$

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

$\sqrt{x^2}=\sqrt{-3} \quad x=2$

$x = \pm i\sqrt{3}$

$\{2, \pm i\sqrt{3}\}$

★Remember, your degree = # of solutions

4) $x^4 - 14x^2 + 45 = 0$

$(x^2-5)(x^2-4)$

$x^2-5=0 \quad x^2-4=0$

$\sqrt{x^2}=\sqrt{5} \quad \sqrt{x^2}=\sqrt{4}$

$x = \pm\sqrt{5} \quad x = \pm 2$

$\{\pm\sqrt{5}, \pm 2\}$

5) $x^4 + 6x^2 + 8 = 0$

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

$x^2+4=0 \quad x^2+2=0$

$\sqrt{x^2}=\sqrt{-4} \quad \sqrt{x^2}=\sqrt{-2}$

$x = \pm 2i \quad x = \pm i\sqrt{2}$

$\{\pm 2i, \pm i\sqrt{2}\}$

6) $x^4 + 3x^2 - 18 = 0$

$(x^2+6)(x^2-3) = 0$

$x^2+6=0 \quad x^2-3=0$

$\sqrt{x^2}=\sqrt{-6} \quad \sqrt{x^2}=\sqrt{3}$

$x = \pm i\sqrt{6} \quad x = \pm\sqrt{3}$

$\{\pm i\sqrt{6}, \pm\sqrt{3}\}$

7) $x^3 - 1 = 0$ SOAP!

$(x-1)(x^2+x+1)$

$x-1=0 \quad x^2+x+1=0$

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

$\frac{-1 \pm \sqrt{1-4}}{2} = \frac{-1 \pm \sqrt{-3}}{2}$

$\left\{1, \frac{-1 \pm i\sqrt{3}}{2}\right\}$

8) $x^3 + 3x^2 - x - 3 = 0$

$x^2(x+3) - 1(x+3)$

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

$x^2-1=0 \quad x+3=0$

$\sqrt{x^2}=\sqrt{1} \quad x=-3$

$x = \pm 1$

$\{-3, -1, 1\}$

9) $x^3 - 2x^2 - 3x + 6 = 0$

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

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

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

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

$x=\pm\sqrt{3}$

$\{\pm\sqrt{3}, 2\}$

10) $x^6 - 2x^4 - 4x^2 + 8 = 0$

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

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

Keep Factoring!

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

$x^2+2=0 \quad x^2-2=0 \quad x^2-2=0$

$\sqrt{x^2}=\sqrt{-2} \quad \sqrt{x^2}=\sqrt{2} \quad \sqrt{x^2}=\sqrt{2}$

$x=\pm i\sqrt{2} \quad x=\pm\sqrt{2} \quad x=\pm\sqrt{2}$

$\{\pm i\sqrt{2}, \pm\sqrt{2}$ mult 2$\}$

graph !!

11) $x^5 + 2x^4 + 11x^3 + 22x^2 + 24x + 48 = 0$

$x=-2$

	5	4	3	2	1	0
-2	1	2	11	22	24	48
	↓	-2	0	-22	0	-48
	1	0	11	0	24	0

$x^4 + 11x^2 + 24 = 0$ FACTOR!

$(x^2+8)(x^2+3)=0$

$x^2+8=0 \quad x^2+3=0$

$\sqrt{x^2}=\sqrt{-8} \quad \sqrt{x^2}=\sqrt{-3}$

$x=\pm 2i\sqrt{2} \quad x=\pm i\sqrt{3}$

$\{-2, \pm 2i\sqrt{2}, \pm i\sqrt{3}\}$

12) $x^6 + 5x^4 - 4x^2 - 20 = 0$

$x^4(x^2+5) - 4(x^2+5)$

$(x^4-4)(x^2+5)=0$

$(x^2+2)(x^2-2)(x^2+5)=0$

$x^2+2=0 \quad x^2-2=0 \quad x^2+5=0$

$\sqrt{x^2}=\sqrt{-2} \quad \sqrt{x^2}=\sqrt{2} \quad \sqrt{x^2}=\sqrt{-5}$

$x=\pm i\sqrt{2} \quad x=\pm\sqrt{2} \quad x=\pm i\sqrt{5}$

$\{\pm i\sqrt{2}, \pm\sqrt{2}, \pm i\sqrt{5}\}$

13) $x^6 - x^4 - x^2 + 1 = 0$

$x^4(x^2-1) - 1(x^2-1)$

$(x^4-1)(x^2-1)=0$

$(x^2+1)(x^2-1)(x^2-1)$

$x^2+1=0 \quad x^2-1=0 \quad x^2-1=0$

$\sqrt{x^2}=\sqrt{-1} \quad \sqrt{x^2}=\sqrt{1} \quad \sqrt{x^2}=\sqrt{1}$

$x=\pm i \quad x=\pm 1 \quad x=\pm 1$

$\{\pm i, \pm 1$ mult 2$\}$

14) $x^8 - 26x^4 + 25 = 0$

$(x^4-25)(x^4-1)$

$(x^2-5)(x^2+5)(x^2-1)(x^2+1)$

$x^2-5=0 \quad x^2+5=0 \quad x^2-1=0 \quad x^2+1$

$\sqrt{x^2}=\sqrt{5} \quad \sqrt{x^2}=\sqrt{-5} \quad \sqrt{x^2}=\sqrt{1} \quad \sqrt{x^2}$

$x=\pm\sqrt{5} \quad x=\pm i\sqrt{5} \quad x=\pm 1 \quad x=$

$\{\pm\sqrt{5}, \pm i\sqrt{5}, \pm 1, \pm i\}$