Algebra II with Support
Unit 3 Polynomial Functions
Review

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1. List the possible rational zeros. (Do NOT Solve)

$(6x^3 + 2x^2 - 3x + 4)$ (q, p)

p: ±1, ±2, ±4
q: ±1, ±2, ±3, ±6

$P/q = \pm 1, \pm\frac{1}{2}, \pm\frac{1}{3}, \pm\frac{1}{6}, \pm 2, \pm\frac{2}{3}$
$\pm 4, \pm 4/3$

2. List the possible rational zeros. (Do NOT Solve)

$(x^3 + 5x^2 - 7x - 24)$ (p)

$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$

3. Divide the polynomials using synthetic division.

$(3x^4 + 5x^3 + 4x^2 + 3x - 9) \div (x + 2)$

$$\begin{array}{r|rrrrr} -2 & 3 & 5 & 4 & 3 & -9 \\ & \downarrow & -6 & 2 & -12 & 18 \\ \hline & 3 & -1 & 6 & -9 & : 9 \end{array}$$

$3x^3 - x^2 + 6x - 9 + \frac{9}{x+2}$

4. Is $(x - 1)$ a factor of the function $f(x) = 4x^3 - 4x^2 - 9x + 9$? Use synthetic division to show why or why not?

$x - 1 = 0$
$x = 1$

$$\begin{array}{r|rrrr} 1 & 4 & -4 & -9 & 9 \\ & \downarrow & 4 & 0 & -9 \\ \hline & 4 & 0 & -9 & : 0 \end{array}$$

yes, because the remainder is 0

5. If $(x+3)$ is a factor of $x^3 - x^2 - 17x - 15$, find the other factors.

$x + 3 = 0$
$x = -3$

$$\begin{array}{r|rrrr} -3 & 1 & -1 & -17 & -15 \\ & \downarrow & -3 & 12 & 15 \\ \hline & 1 & -4 & -5 & : 0 \end{array}$$

$x^2 - 4x - 5$
$(x-5)(x+1)$

6. If 2 is a zero of $f(x) = x^3 - 8x^2 + 5x + 14$, find the other zeros.

$$\begin{array}{r|rrrr} 2 & 1 & -8 & 5 & 14 \\ & \downarrow & 2 & -12 & -14 \\ \hline & 1 & -6 & -7 & : 0 \end{array}$$

$x^2 - 6x - 7 = 0$
$(x+1)(x-7) = 0$

$x + 1 = 0$ $\quad x - 7 = 0$
$x = -1$ $\quad x = 7$

#7-10: Find the zeros of the polynomial functions. (*Exact answers, no decimals*)

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

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

you can get all of these from your calculator

8. $g(x) = 2x^3 - 6x^2 - 6x + 18$

$x = 3$ (calc)
$x = \pm\sqrt{3}$

$$\begin{array}{r|rrrr} 3 & 2 & -6 & -6 & 18 \\ & \downarrow & 6 & 0 & -18 \\ \hline & 2 & 0 & -6 & : 0 \end{array}$$

$2x^2 - 6 = 0$
$\frac{2x^2}{2} = \frac{6}{2}$

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

9. $j(x) = x^4 - 5x^3 + 8x^2 - 20x + 16$

$x = 1$ ← calc
$x = 4$
$x = \pm 2i$

1	1	-5	8	-20	16
	↓	1	-4	4	-16
	1	-4	4	-16	: 0
4	↓	4	0	16	
	1	0	4	: 0	

$x^2 + 4 = 0$
$-4 \quad -4$
$\sqrt{x^2} = \sqrt{-4}$
$x = \pm 2i$

10. $f(x) = 3x^3 + 5x^2 - 2x - 4$

$x = -1$ (calc)
$x = \frac{-1 \pm \sqrt{13}}{3}$

-1	3	5	-2	-4
	↓	-3	-2	4
	3	2	-4	: 0

$x^2 + 4 = 0$

$3x^2 + 2x - 4 = 0$
$a = 3 \quad b = 2 \quad c = -4$
$x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(-4)}}{2(3)}$
$x = \frac{-2 \pm \sqrt{52}}{6} = \frac{-2 \pm 2\sqrt{13}}{6} = \frac{-1 \pm \sqrt{13}}{3}$

11. Given the following zeros of a function: $1 + \sqrt{2}$, $2i$ what are the *missing* zeros? (Do Not Solve)

$1 - \sqrt{2}$ and $-2i$

12. Write a polynomial function with zeros -2, 5, and 3.

$(x+2)(x-5)(x-3)$
$(x+2)(x^2 - 8x + 15)$
$x^3 - 8x^2 + 15x + 2x^2 - 16x + 30$

$x^3 - 6x^2 - x + 30$

13. Write a polynomial function with zeros -4 and 3i. + $-3i$ *remember $\sqrt{}$ + i comes in pairs (±)

$(x+4)(x-3i)(x+3i)$
$(x+4)(x^2 + 3ix - 3ix - 9i^2)$
$-9(-1)$
$(x+4)(x^2+9)$
$x^3 + 4x^2 + 9x + 36$

Factor completely.

14. $x^2 - 81$

$(x+9)(x-9)$

15. $x^3 + 8$

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

16. $(x^3 - 5x^2) + (4x - 20)$

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

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

17. $6x^2 - x - 15$

-90
$-10 \quad 9$
-1

	$3x$	-5
$2x$	$6x^2$	$-10x$
3	$9x$	-15

$(3x-5)(2x+3)$