HW 5-4 Answers

1. They are imaginary (covered in unit 4)
2. There are 4 real zeros
3. The power tells you the number of zeros, so there are "m"
4. $(x + 5)(x^2 - 5)$
5. $(1 + 3x)(1 - 3x + 9x^2)$

6. a. 4
b. -
c.

7. a. 7
b. +
c.

8 - 11 See next page

12. $P(x) = x^2(x + 5)(x - 3)$
13. $P(x) = x(x + 2)(x - 2)$

When you have finished checking your homework answers please do the warm-up at the top of today's notes.

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1. The graph of a polynomial function never passes through the x-axis but passes through the y-axis once. What does that tell you about the zeros of the graph?

they are imaginary (covered in unit 4)

2. The graph of a polynomial function passes through the x-axis four times and the y-axis once. What does this tell you about the zeros of the graph?

there are 4 real zeros

3. Consider the polynomial $P(x) = Ax^m + Bx$. What can you determine about the number of zeros from the equation?

the power tells you the number of zeros, so there are "m"

In 4 & 5, factor:

4. $x^3 + 5x^2 - 5x - 25$

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

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

5. $1 + 27x^3$

$a = 1 \quad b = 3x$

$(1+3x)(1-3x+9x^2)$

Without your calculator:
a. state degree
b. state the sign of the leading coefficient
c. sketch (no graph paper) the end behavior

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

a. 4
b. −
} − even
c.

7. $P(x) = 4x^7 + 2x^3 - 5x$

a. 7
b. +
} + odd
c.

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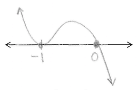
Find the zeros of each polynomial, state the multiplicity of each. Sketch (including the end behavior) – no calculators!

8. $P(x) = -x(x + 1)^2$

Z	M	T/C
-1	2	T
0	1	C

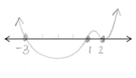
− odd



9. $Q(x) = (x + 3)(x - 1)(x - 2)^2$

Z	M	T/C
-3	1	C
1	1	C
2	2	T

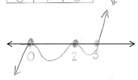
+ even



10. $R(x) = 4x^2(x - 2)^2(x - 3)$

Z	M	T/C
0	2	T
2	2	T
3	1	C

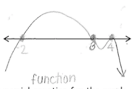
+ odd



11. $M(x) = -(x + 2)^3(x - 3)(x - 4)^2$

Z	M	T/C
-2	3	C
3	1	C
4	2	T

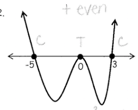
− even



function

Given the following graphs, write a possible polynomial equation for the graph.

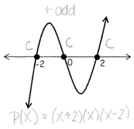
12. + even



$P(x) = (x+5)(x)^2(x-3)$

$P(x) = x^2(x+5)(x-3)$

13. + odd



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

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

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Day 5

Factoring & Solving

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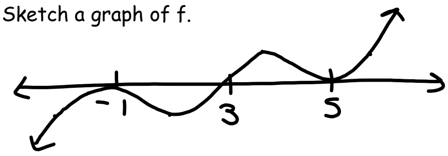
Warm-Up:
A function f has zeros at -1, 3, and 5. We know that f(-2) and f(2) are negative, while f(4) and f(6) are positive. Sketch a graph of f.



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You have been given a set of problems.
The directions for some say, "factor" whereas others say, "solve".
What's the difference between the two? How would you expect your answers to look?

factor → simplify
solve → find the value(s) of the variable

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Factor completely each of the following:

1. $x^8 - 1$ DOTS

$= (x^4+1)(x^4-1)$

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

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

2. $x^4 - 2x^2 + 1$ Product $\underline{1}$ Sum $\underline{-2}$ $\underline{-1}, \underline{-1}$

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

$= (x-1)(x+1)(x-1)(x+1)$

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

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(hint: be careful with this one!)

3. $64x^6 - 1$ ① DOTS ② Diff of 2 Cubes

$= (8x^3+1)(8x^3-1)$ $\sqrt[3]{8x^3}$ $\sqrt[3]{1}$

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

4. $2x^5 + x^4 + 2x^3 + x^2$

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

$= x^2[x^2(2x+1)+1(2x+1)]$

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

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5. $x^{5n} + x^{2n}$ $\sqrt[3]{x^{3n}} = x^n$ $\sqrt[3]{1} = 1$

$= x^{2n}(x^{3n}+1)$

$= x^{2n}(x^n+1)(x^{2n}-x^n+1)$

6. $2(x + 2)^2 + (x + 2) - 3$ Let $u = x+2$

$= 2u^2 + u - 3$ Prod $\underline{-6}$ Sum $\underline{1}$ $\underline{-2}, \underline{3}$

$= 2u^2 - 2u + 3u - 3$

$= 2u(u-1)+3(u-1)$

$= (u-1)(2u+3)$

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

$= (x+1)(2x+4+3)$

$= (x+1)(2x+7)$

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7. $25x^{2n} - 625$

$= 25(x^{2n}-25)$

$= 25(x^n-5)(x^n+5)$

All of the previous problems were factorable. If we set each of them equal to 0, only some are solvable. Why?

① We have more than 1 unknown.

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Solve each of the following (factor completely first):

1. $4x^5 - 8x^3 + 4x = 0$

2. $x^6 - 16x^2 = 0$

$x^2(x^4-16) = 0$

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

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

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

$\{0, \pm 2, \pm 2i\}$

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3. $x^4 - 13x^2 + 36 = 0$

4. $3x^4 - 24x = 0$

$3x(x^3-8) = 0$

$3x(x-2)(x^2+2x+4) = 0$

$3x = 0$	$x-2 = 0$	$x^2+2x+4 = 0$
$x = 0$	$x = 2$	$x^2+2x+\underline{1} = -4+\underline{1}$
		$\sqrt{(x+1)^2} = \sqrt{-3}$
		$x+1 = \pm i\sqrt{3}$
		$x = -1 \pm i\sqrt{3}$

$\{0, 2, -1 \pm i\sqrt{3}\}$

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