MIDTERM REVIEW SPRING 2016 ALGEBRA 2

1. Simplify completely. Write an equivalent expression in standard form:
   - A. $8(x-4)-7(x-2)$
   - B. $-5x^2(x+6)-3x(x+1)+4(x-2)$
   - C. $(x^2+7x-3)-(-9x^2-11x+5)$

A. $8x-12-7x+14$ → $x+2$

B. $-5x^3-30x^2-3x^2-3x+4x-8$ → $-5x^3-33x^2+x-8$

C. $x^2+7x-3+9x^2+11x-5$ → $10x^2+18x-8$

2. Use Pascal's Triangle
   - A. Find the coefficient of the 4th term in the expansion $(x+2y)^3$ — 8
   - B. Find the 3rd term of the expansion of $(3a-5b)^6$ — $30,375a^4b^2$
   - C. Find the x^2y^5 term of the expansion $(x-2y)^7$ — $-672x^2y^5$
   - D. Expand completely $(2a-3b)^4$

A. $1(x)^0(2y)^3$ → $8y^3$

B. $15(3a)^4(-5b)^2$ → $15(81a^4)(25b^2)=30,375a^4b^2$

C. $21(x)^2(-2y)^5$ → $21x^2(-32y^5)$

3. Write the polynomial in standard form. Then name the polynomial based on its degree and number of terms:
   - A. $6x-10x^2-3+2x^2$ — $-8x^2+6x-3$ — QUADRATIC TRINOMIAL
   - B. $x-4x^3+5x+x^3$ — $-3x^3+6x$ — CUBIC BINOMIAL

4. The cost of producing n toys at a factory is given by the polynomial $0.5n^2+4n+19$. The cost of packaging is $0.25n^2+3n-29$. Write and simplify an expression for the total cost of producing and packaging n toys. This is an addition problem — $.75n^2+7n-10$

5. Factor completely: $3x^2(3x-2)(x^2-3)$
   - A. By grouping: $9x^5-6x^4-27x^3+18x^2$ → GCF: $3x^2(3x^3-2x^2-9x+6)$ → $3x^2(x^2(3x-2)-3(3x-2))$

     $AP-KP+AQ-KQ$ → $P(A-K)+Q(A-K)$ → $(A-K)(P+Q)$
   - B. Factor using cubes patterns: $8x^3-27$ → $(2x-3)(4x^2+6x+9)$

     $2a^3-250b^3$ → GCF: $2(a^3-125b^3)$ → ~~$2(a-5b)$~~ → $2(a-5b)(a^2+5ab+25b^2)$
   - C. Factor using the difference of squares:

x^2-4	$(x-2)(x+2)$	x^2-100	$(x-10)(x+10)$	$9x^2-16$	$(3x-4)(3x+4)$
x^2-25	$(x-5)(x+5)$	x^2-16	$(x-4)(x+4)$	$100x^2-121$	$(10x-11)(10x+11)$
x^2-49	$(x-7)(x+7)$	x^2-121	$(x-11)(x+11)$	$4x^2-49$	$(2x-7)(2x+7)$

   - D. Factor using product/sum (Big X)

1, −70
2, 35
5, 14
7, 10

$x^2+5x-36$ → $(x+9)(x-4)$

$2x^2-19x-35$ → prime (−70, −19)

$-4x^2+8x+12$ GCF: -4 → $-4(x^2-2x-3)$ → $-4(x-3)(x+1)$

$24x^2+34x-14$ GCF: 2 → $2(12x^2+17x-7)$ → $2(4x+7)(3x-1)$ (−84, 17; $\frac{21}{12}$, $-\frac{4}{12}$ → $\frac{7}{4}$, $-\frac{1}{3}$)

6. Find the product of 7+3i and its conjugate. $(7+3i)(7-3i)$

$49-21i+21i-9i^2$

$49-9(-1) \rightarrow 49+9 \rightarrow 58$

7. After applying the distributive property, which of these results in a *perfect square trinomial?*

A. $(x+5)(x-5)$ B. $x(x-7)$ C. $(x-8)^2$ D. $(x+6)(x+8)$

↑ this is a perfect square trinomial! It's what you use for completing the square

8. Which method of solving can be used for every quadratic equation?

quadratic formula

9. Use the Zero Product Property to find all the solutions to the equation

$8x(x+12)(2x-7)=0$

$8x=0 \quad x+12=0 \quad 2x-7=0$

$x=0 \quad x=-12 \quad 2x=7$

$x=\frac{7}{2}$

10. Simplify completely:

A. $(5+8i)(3-i)$ B. $2i(4+3i)$

$15-5i+24i-8i^2$

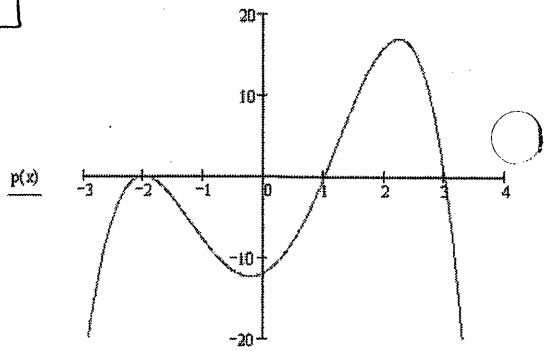
$15+19i+8 \rightarrow \boxed{23+19i}$

$8i+6i^2$

$8i+6(-1)$

$\boxed{-6+8i}$

Use the following graph to answer questions 11 - 13



11. What is a possible equation, in factored form, for the function shown? $-(x+2)^2(x-1)(x-3)$

12. The function has a multiplicity of 2 at $x=-2$

13. The least possible degree of the function is 4

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14. Given the factored form of the polynomial function $f(x)=(x-2)(x+3)(x+10)$, what are the zeros?

$x=2, \; x=-3, \; x=-10$

15. Given the factored form of the polynomial function $f(x)=(x+8)^4(x-7)$, there is a multiplicity of 4 at $x=-8$.

16. What are the solutions of the equation: $x^3-5x^2-36x=0$?

$x(x^2-5x-36) \qquad x(x-9)(x+4)=0$

$x=0, \; x=9, \; x=-4$

17. What are the zeros of the function: $f(x)=x^4-6x^3-44x^2+184x+96$? $4, -6, 4+2\sqrt{5}, 4-2\sqrt{5}$

$x=4 \quad 1 \quad -6 \quad -44 \quad 184 \quad 96 \quad | \quad 1 \quad -2 \quad -52 \quad -24$

$\qquad\quad 4 \quad -8 \quad -208 \quad -96$

$x=-6 \quad 4|1 \quad -2 \quad -52 \quad -24 \quad 0 \quad | \quad -6|1 \quad -8 \quad -4 \quad 0$

$x^2-8x-4=0$

$x^2-8x=4$

$x^2-8x+16=4+16$

$(x-4)^2=20$

$x-4=\pm\sqrt{20}$

$x=4\pm 2\sqrt{5}$

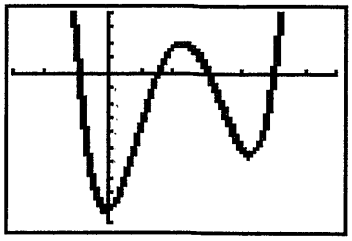
18. What are all the zeros of the function $f(x) = x^4 + 9x^3 + 27x^2 - 23x - 150$?

$x=2, \; x=-3, \; -4\pm 3i$

(N back)

FOR #17, #18, put into tables to find a zero; use synthetic division to get depressed row that is quadratic

Use the graph for problems 19 - 24



19. How many extrema does this function have?

3

20. What is the least possible degree of the function?

4

21. Which of the following statements is FALSE for the function shown?

a. The domain is $(-\infty, \infty)$.

b. The degree is even

c. The function is even False; it is not symmetrical across y-axis

d. The function has no maximum.

22. Is the leading coefficient positive or negative? positive

23. What is the range of the function? $[-9, +\infty)$

24. Which of these could describe the end behavior of the function?

A. $f(x) \to -\infty$ as $x \to +\infty$ C. as $x \to +\infty$, $f(x) \to -\infty$

B. $f(x) \to -\infty$ as $x \to -\infty$ D. as $x \to -\infty$, $f(x) \to +\infty$ ✓

25. For the polynomial $f(x) = 3x^3 - 2x^2 + 5x - 9$, find the average rate of change on the intervals $[7,9]$ and $[-2,3]$ use tables

(7, 957) and (9, 2061) $\frac{2061-957}{9-7} = \frac{1104}{2} = 552$ (-2, -51) (3, 69) $\frac{69-(-51)}{3-(-2)} = \frac{120}{5} = 24$

26. What is the solution set in interval notation for: $x^3 - 7x \geq 0$

$x(x^2-7) \geq 0$

$x = 0$ $x^2 = 7$

$x = \pm\sqrt{7}$

$[-\sqrt{7}, 0] \cup [\sqrt{7}, +\infty)$

27. Solve the inequality: $x^3 - 4x^2 - 5x < 0$

$x(x^2-4x-5) < 0$

$x(x-5)(x+1) < 0$

$x = 0$

$x = 5$

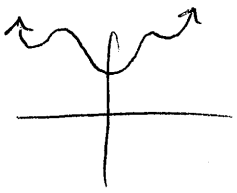
$x = -1$

$(-\infty, -1) \cup (0, 5)$

28. Which one of these functions is odd?

a. $f(x) = 19$ b. $f(x) = x^7 + 17$ c. $x^8 - 11x^6 - 2x$ d. $f(x) = 6x^5 - 8x$

29. Sketch an even function



1								R0
1	1							R1
1	2	1						R2
1	3	3	1					R3
1	4	6	4	1				R4
1	5	10	10	5	1			R5
1	6	15	20	15	6	1		R6
1	7	21	35	35	21	7	1	R7

$(2a-3b)^4$

$1(2a)^4(-3b)^0 \quad 4(2a)^3(-3b)^1 \quad 6(2a)^2(-3b)^2 \quad 4(2a)^1(-3b)^3 \quad 1(2a)^0(-3b)^4$

$1(16a^4)(1) \quad 4(8a^3)(-3b) \quad 6(4a^2)(9b^2) \quad 4(2a)(-27b^3) \quad 1(1)(81b^4)$

$16a^4 - 96a^3b + 216a^2b^2 - 216ab^3 + 81b^4$

18.

	1	9	27	−23	−150
		2	22	98	150
2	1	11	49	75	0
		−3	−24	−75	
−3	1	8	25	0	

$x^2 + 8x + 25 = 0$

$\frac{-8 \pm \sqrt{64-4(1)(25)}}{2}$ $\quad \frac{-8 \pm \sqrt{64-100}}{2}$

$\frac{-8 \pm \sqrt{-36}}{2}$ $\quad \frac{-8 \pm 6i}{2}$

$-4 \pm 3i$