Essex County Math League
May 24, 2018
Algebra 2

Directions: You may write on this test. Be sure that your name, subject, and school (including town name) are on the answer sheet. Mark the answer sheet with dark, careful marks using a #2 pencil. Your score will be determined by your number of correct answers, incorrect answers will NOT lower your score. You MAY only use a calculator on this test that is approved for use on the SAT's. The answer to the tie-breaker should be placed on the answer sheet in the place indicated by the proctors. The tie-breaker will be scored only in the case of a tie between the top scorers, and will not count as part of the team score. The fifth choice for each question is, NG, which means, "not given" and is a valid answer that indicates that the correct answer is not among the answers given.

1) Find the cubic equation whose roots are 3 and 2 – i, where $i^2 = -1$.

a) $(x-3)(x-2+i)=0$ b) $x^3+x^2-7x-15=0$ c) $x^3-7x^2+17x-15=0$

d) $(x-3)(x-2-i)(x+2-i)=0$ e) NG

2) Simplify completely: $\dfrac{x-2+\dfrac{1}{x}}{x+1-\dfrac{2}{x}}$

a) $-\dfrac{1}{2}$ b) $\dfrac{x^2-2}{x^2+1}$ c) $\dfrac{x^2-1}{x^2+1}$ d) $\dfrac{x-1}{x+2}$ e) NG

3) Solve: $\sqrt{x+3}=x+1$

a) -2 b) -2 or 1 c) 1 d) 1 or -1 e) NG

4) Factor completely: x^6-64

a) $(x^3-8)(x^3+8)$ b) $(x-2)^6$ c) $(x-2)^3(x+2)^3$ d) $(x^2-4)(x^4+4x^2+16)$ e) NG

5) Find the sum of the coordinates of the vertex of the parabola: $y = x^2 + 4x - 5$

a) -11 b) -7 c) 7 d) 11 e) NG

6) The illumination from a light varies inversely as the square of the distance from the source. How far must a screen that is 10 feet from a lamp be **moved** in order to receive ¼ as much light?

a) 10 ft b) 20 ft c) 30 ft d) 40 ft e) NG

7) Solve the system of equations:
$$\frac{x+y}{2} - \frac{x-y}{3} = 8$$
$$\frac{x+y}{3} + \frac{x-y}{4} = 11$$

a) (12, 4) b) (18, 6) c) (8, 8) d) (12, 6) e) NG

8) Find the quotient of $x^3 - 3x^2 - 4x + 12$ and x – 2.

a) $x^2 - x - 6$ b) $x^2 + 5x + 6$ c) $x^2 - x + 6$ d) $x^2 - 5x + 6$ e) NG

9) In a cage, at the zoo, live six friendly parrots. Each morning they greet each other individually with a "hello." How many greeting can be heard each morning?

a) 30 b) 15 c) 12 d) 6 e) NG

10) Given $f(x) = |x - 1|$ and g(x) = x – 1, and let h = f(g(x)) + g(f(x)). Find the minimum value of h.

a) -1 b) 1 c) 2 d) 0 e) NG

11) Given the system of equations: $x - y^2 + 1 = 0$, $x + y - 1 = 0$, find the distance between the two points of intersection.

a) $2\sqrt{2}$ b) $2\sqrt{3}$ c) $3\sqrt{2}$ d) $3\sqrt{3}$ e) NG

12) Solve for x: $4^{2x^2-3} = 8$

a) 3/2 b) -3/2 c) $\pm 3/2$ d) no solution e) NG

13) If $x^2 - 3x - 4 > 0$ is the domain of $f(x) = x^2 - 9$, what is the range of f(x) ?

a) $f(x) > 0$ b) $f(x) > 7$ c) $f(x) > -8$ d) $f(x) > -5$ E) NG

14) Given: $f(x) = ax^4 + bx^2 + cx + 1$, $g(x) = 8ax^2 - 2bx + c$ and f(2)=5, find g(-1)=

a) -2 b) 2 c) 4 d) 5 e) NG

15) Find the shortest distance between the two parallel lines: y = x, and y = x+2 approximated to two decimal places.

a) 2.65 b) 2.24 c) 2.00 d) 1.41 e) NG

16) Find the solution set of: $\frac{|2x+1|}{x-1} < 3$

a) $x < 0$ or $x > 4$ b) $x<1$ c) $x < 1$ or $x > 4$ d) $x>4$ e) NG

17) The graph of $|y+2| = |x-2|$ forms 2 intersecting lines. The point where the two lines intersect lies

a) in quadrant I b) in quadrant II c) in quadrant III

d) in quadrant IV e) NG

18) Given: $x^2 + y^2 = 68$ and xy = 16, find: $|x - y| =$

a) 4 b) 8 c) 16 d) 32 e) NG

19) Give an equivalent form of: $\frac{\log_a b}{\log_c a} =$

a) $\log_a bc$ b) $\log_c b$ c) $(\log_a b)(\log_a c)$ d) $\log_a (b+c)$ e) NG

20) Consider the following relations:

I. $x^2 = y^2$

II. $x^2 + y^2 = 4$

III. $\frac{1}{x} + \frac{1}{y} = 1$

Which of the following statements is true?

a) all 3 relations are symmetric to the y-axis
b) only I is symmetric to the y-axis
c) only I and III are symmetric to the y-axis
d) only I and II are symmetric to the y-axis
e) NG

Tie breaker: This question will be scored only if there is a tie amongst the highest scorers. Please write your answer in the area described by the proctors.

The real solution(s) of the following are: $4x + 3\sqrt{x} - 1 = 0$

	ECML Answers 2018						
Algebra 1		Geometry		Algebra 2		Advanced Math	
Quest. #	Answer	Quest. #	Answer	Quest. #	Answer	Quest. #	Answer
1)	C	1)	B	1)	C	1)	D
2)	E	2)	A	2)	D	2)	A
3)	C	3)	C	3)	C	3)	A
4)	B	4)	B	4)	E	4)	B
5)	D	5)	A	5)	A	5)	D
6)	B	6)	C	6)	A	6)	D
7)	C	7)	C	7)	B	7)	C
8)	C	8)	B	8)	A	8)	C
9)	D	9)	D	9)	A	9)	A
10)	A	10)	C	10)	D	10)	A
11)	A	11)	C	11)	C	11)	A
12)	C	12)	D	12)	C	12)	B
13)	E	13)	D	13)	C	13)	B
14)	A	14)	A	14)	B	14)	C
15)	D	15)	B	15)	C	15)	E
16)	B	16)	B	16)	C	TB	2+(1-)=1
17)	B	17)	B	17)	D		
18)	E	18)	A	18)	E		
19)	A	19)	C	19)	C		
20)	A	20)	C	20)	D		
TB	(1, 8)	TB	"8	TB	"1/16"	n	