Algebra II Individual

Haynes Mu Alpha Theta 2019

Instructions

1. You have 50 minutes for this test.
2. No calculators allowed on this test.
3. Do all scratch work on your test.
4. Provide exact answers unless otherwise stated.
5. Units are not required; if units are given, however, they must be correct.
6. Put name and school code on answer sheet.
7. Good luck and have fun!

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School_____

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Haynes MAO 2019- Algebra II Individual

1) Given that $f(x) = 3x^2 - 4$ and $g(x) = 2x - 6$, what is $g(f(2))$?

2) Find x: $\frac{3}{2x+10} + \frac{5}{4} = \frac{7}{x+5}$

3) In 2 years, Bob's age will be 3 times his sister's age 4 years ago. Currently, the sum of Bob and his sister's ages is 30. What is Bob's current age?

4) Find all asymptotes of $f(x) = \frac{x^2-36}{x^2-8x+15}$

5) Ms. Coogler's class dropped eggs off of a building. The eggs' height over time can be represented by $f(x) = -16x^2 + 96x + 20$, where x is time in seconds and $f(x)$ is height in feet. How many seconds did it take for an egg to reach its maximum height?

6) Factor completely: $x^3 - 2x^2 - 9x + 18$

7) If $\sqrt{\sqrt[3]{128} + \sqrt[3]{250}}$ can be written as $a\sqrt[b]{c}$, where a, b, and c are positive integers, find $a + b + c$.

8) If $\frac{(2+5i)(3+7i)}{1+i}$ is written is the form $a+bi$, find $a+b$.

9) Simplify $\frac{x+3}{x^2+3x-10} \times \frac{x^2+2x-8}{x^2+2x-3} \div \frac{3x+12}{x^2+11x+30}$

10) Solve for x: $2-x=3-\sqrt{7-3x}$

11) The Haynes basketball team has won 60% of their games so far. There have been no ties. If the team wins all of their next 15 games, they will have a winning percentage of 75%. How many games has the team played so far?

12) An arithmetic sequence has a common difference of 16 and a geometric sequence has a common ratio of 2. The 5th term of both sequences is 192. If the first term of the arithmetic sequence is a_1 and the first term of the geometric sequence is g_1, find a_1+g_1.

13) Solve the equation $2log(x)+log\ 3=log\ 75$.

14) The current in a river is moving at 6 mph. Anupam can travel 12 miles upstream or 16 miles downstream in the same amount of time if he is in a motorboat. What is the speed of the motorboat in still water?

15) Given that complex numbers x, y satisfy $x^3 - y^3 = 98i$ and $x - y = 7i$, if $xy = a + bi$ where a, b are real numbers, find the value of $\frac{a+b}{3}$

16) James, Anupam, and Kiet take 6 hours to do a job working together. If James can finish the job 7 times faster than Kiet, and Anupam can finish the job 4 times faster than Kiet, how long will it take for Anupam to finish the job?

17) Solve for x: $((x-1)(x+3) - (x+4)(x-5))^2 = 0$

18) A cubic polynomial of the form $y = x^3 + bx^2 + cx + d$, where b, c, and d are all real numbers, has roots of $2 + i$ and 5. (Note: these may not be the only roots of the polynomial) Find $b + c + d$.

19) The parabolas $y = ax^2 - 2$ and $y = 4 - bx^2$ intersect the coordinate axes at exactly 4 points, and these 4 points are the vertices of a kite with area 24. Find $a + b$.

20) Find the sum of all distinct real values of x that satisfy $(x^2 - 9x + 19)^{x^2 + 2x - 3} = 1$.

Answer Key

(Note: units are not required if they are in parentheses; if provided, however, units must be correct)

1. 10
2. $x = -3/5$
3. 19 (years)
4. $x = 3,\ x = 5,\ y = 1$
5. 3 (seconds)
6. $(x-3)(x+3)(x-2)$
7. 11
8. 29
9. $\frac{x+6}{3x-3}$ or $\frac{x+6}{3(x-1)}$
10. $x = 1$
11. 25 (games)
12. 140
13. $x = 5$
14. 42 (mph)
15. 7
16. 18 (hrs)
17. $x = -17/3$
18. -9
19. 3/8
20. 12