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1. 010201b, P.I. A2.A.2  
The roots of a quadratic equation are real, rational, and equal when the discriminant is  
[A] -2      [B] 0      [C] 2      [D] 4
2. 060717b, P.I. A2.A.2  
Which number is the discriminant of a quadratic equation whose roots are real, unequal, and irrational?  
[A] -5      [B] 7      [C] 0      [D] 4
3. 060103b, P.I. A2.A.2  
Jacob is solving a quadratic equation. He executes a program on his graphing calculator and sees that the roots are real, rational, and unequal. This information indicates to Jacob that the discriminant is  
[A] negative      [B] not a perfect square  
[C] a perfect square      [D] zero
4. 080106b, P.I. A2.A.2  
The roots of the equation  $x^2 - 3x - 2 = 0$  are  
[A] real, rational, and unequal  
[B] imaginary  
[C] real, rational, and equal  
[D] real, irrational, and unequal
5. 060910b, P.I. A2.A.2  
The roots of the equation  $x^2 - 5x + 1 = 0$  are  
[A] real, irrational, and unequal  
[B] imaginary  
[C] real, rational, and equal  
[D] real, rational, and unequal
6. 080814b, P.I. A2.A.2  
The roots of the equation  $5x^2 - 2x + 1 = 0$  are  
[A] real, rational, and unequal  
[B] imaginary  
[C] real, rational, and equal  
[D] real, irrational, and unequal
7. 010513b, P.I. A2.A.2  
The roots of the equation  $2x^2 - 8x - 4 = 0$  are  
[A] real, rational, and unequal  
[B] real, rational, and equal  
[C] real, irrational, and unequal  
[D] imaginary
8. 060219b, P.I. A2.A.2  
The roots of the equation  $2x^2 - x = 4$  are  
[A] real, rational, and equal  
[B] imaginary  
[C] real, rational, and unequal  
[D] real and irrational

NAME: \_\_\_\_\_

9. 010614b, P.I. A2.A.2  
The roots of the equation  $2x^2 - 5 = 0$  are  
[A] real, rational, and equal  
[B] real and irrational  
[C] real, rational, and unequal  
[D] imaginary
10. 010817b, P.I. A2.A.2  
Which equation has roots that are real, rational, and unequal?  
[A]  $x^2 - 2 = 0$  [B]  $x^2 + x + 1 = 0$   
[C]  $x^2 - 4x + 4 = 0$  [D]  $x^2 - 4 = 0$
11. 080211b, P.I. A2.A.2  
Which equation has imaginary roots?  
[A]  $x^2 + x + 1 = 0$  [B]  $x^2 - 2 = 0$   
[C]  $x^2 - 1 = 0$  [D]  $x^2 - x - 1 = 0$
12. 060518b, P.I. A2.A.2  
Which equation has imaginary roots?  
[A]  $x(x + 6) = -10$  [B]  $(2x + 1)(x - 3) = 7$   
[C]  $x(5 + x) = 8$  [D]  $x(5 - x) = -3$
13. 080516b, P.I. A2.A.2  
For which positive value of  $m$  will the equation  $4x^2 + mx + 9 = 0$  have roots that are real, equal, and rational?  
[A] 9 [B] 12 [C] 3 [D] 4
14. 060307b, P.I. A2.A.2  
The roots of the equation  $ax^2 + 4x = -2$  are real, rational, and equal when  $a$  has a value of  
[A] 3 [B] 4 [C] 2 [D] 1
15. 080320b, P.I. A2.A.2  
In the equation  $ax^2 + 6x - 9 = 0$ , imaginary roots will be generated if  
[A]  $a < 1$ , only [B]  $a > -1$ , only  
[C]  $-1 < a < 1$  [D]  $a < -1$
16. 080411b, P.I. A2.A.2  
The equation  $2x^2 + 8x + n = 0$  has imaginary roots when  $n$  is equal to  
[A] 8 [B] 6 [C] 4 [D] 10
17. 060423b, P.I. A2.A.2  
Find all values of  $k$  such that the equation  $3x^2 - 2x + k = 0$  has imaginary roots.
18. 010416b, P.I. A2.A.2  
Which statement must be true if a parabola represented by the equation  $y = ax^2 + bx + c$  does not intersect the  $x$ -axis?  
[A]  $b^2 - 4ac = 0$  [B]  $b^2 - 4ac < 0$   
[C]  $b^2 - 4ac > 0$ , and  $b^2 - 4ac$  is a perfect square.  
[D]  $b^2 - 4ac > 0$ , and  $b^2 - 4ac$  is not a perfect square.

NAME: \_\_\_\_\_

19. 010313b, P.I. A2.A.2

If the roots of  $ax^2 + bx + c = 0$  are real, rational, and equal, what is true about the graph of the function  $y = ax^2 + bx + c$ ?

- [A] It lies entirely above the  $x$ -axis.
- [B] It lies entirely below the  $x$ -axis.
- [C] It intersects the  $x$ -axis in two distinct points.
- [D] It is tangent to the  $x$ -axis.

20. 010713b, P.I. A2.A.2

Which is a true statement about the graph of the equation  $y = x^2 - 7x - 60$ ?

- [A] It does not intersect the  $x$ -axis.
- [B] It is tangent to the  $x$ -axis.
- [C] It intersects the  $x$ -axis in two distinct points that have rational coordinates.
- [D] It intersects the  $x$ -axis in two distinct points that have irrational coordinates.

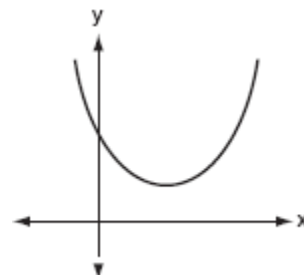
21. 080525b

Given the function  $y = f(x)$ , such that the entire graph of the function lies above the  $x$ -axis. Explain why the equation  $f(x) = 0$  has no real solutions.

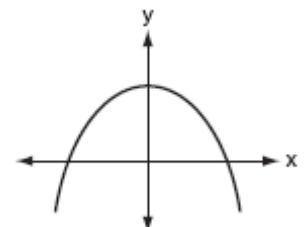
22. 080620b

Which graph represents a quadratic function with a negative discriminant?

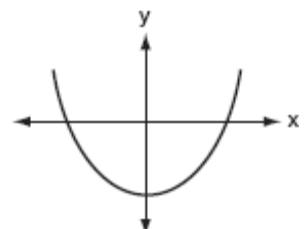
[A]



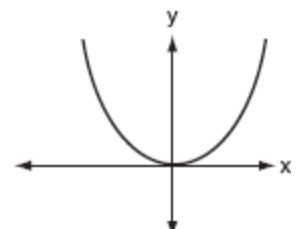
[B]



[C]



[D]



[1] B \_\_\_\_\_

[2] B \_\_\_\_\_

[3] C \_\_\_\_\_

[4] D \_\_\_\_\_

[5] A \_\_\_\_\_

[6] B \_\_\_\_\_

[7] C \_\_\_\_\_

[8] D \_\_\_\_\_

[9] B \_\_\_\_\_

[10] D \_\_\_\_\_

[11] A \_\_\_\_\_

[12] A \_\_\_\_\_

[13] B \_\_\_\_\_

[14] C \_\_\_\_\_

[15] D \_\_\_\_\_

[16] D \_\_\_\_\_

[2]  $k > \frac{1}{3}$ , and appropriate work is shown,

such as the solution of  $4 - 4(3)(k) < 0$ .

[1] Appropriate work is shown, but one conceptual error or one computational error is made.

or [1] Appropriate work is shown, but the answer is written as  $k < \frac{1}{3}$ .

or [1]  $k > \frac{1}{3}$ , but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[17] incorrect procedure. \_\_\_\_\_

[18] B \_\_\_\_\_

[19] D \_\_\_\_\_

[20] C \_\_\_\_\_

[2] A complete and correct explanation is written, such as stating that since the graph lies entirely above the  $x$ -axis, there is no point on the graph where  $y = 0$ .

[1] An incomplete or partially correct explanation is written, such as stating that the equation has imaginary roots.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[21] incorrect procedure. \_\_\_\_\_

[22] A \_\_\_\_\_