March Algebra 2 Individual Solutions

1. D

Factoring the function, we find: $f(x) = (x-2)^2(x+1)(x+2)$. Based on a quick sketch, we can determine the following:

A is not possible as there must be a turning point in the interval.
B is not possible due to the turning point in this interval.
C is not possible as there must be a turning point in the interval.
D is continuously increasing, so no values should be repeated over this interval.

2. A

$(2-i)^2 + 6(2-i) + 8 = \big((2-i)+2\big)\big((2-i)+4\big) = (4-i)(6-i) = 24 - 10i - i^2 = 23 - 10i.$

3. C

$y = -3.2x + 5.7$
$y = -4.9x^2 + 7.4x$
$-3.2x + 5.7 = -4.9x^2 + 7.4x$
$-32x + 57 = -49x^2 + 74x$
$0 = -(x-1)(49x - 57)$
$x = 1$ is the first time this happens. Evaluating, we get an output of 2.5. 1+2.5=3.5

4. A

This parabola opens to the right, so 4c = 14, which means c = 3.5. Therefore, the directrix is located 3.5 units to the left of the vertex, which would be at $x = -7$.

5. B

The word factor means multiplying. So the growth factor is 1.4

6. D

$A(2) = 8b - 2c + 2 = 0$
$A(-3) = -27b + 3c + 2 = 0$
$-6 = 24b - 6c$
$-4 = -54b + 6c$
$b = \frac{1}{3},\ \ c = \frac{7}{3}$
so $b - c = -2$

7. B

$2x^2 + 4x + 9 = 0$, so $\frac{-4 \pm \sqrt{16-72}}{4} = \frac{-4 \pm \sqrt{56}i}{4} = \frac{-4 \pm 2\sqrt{14}i}{4} = \frac{-2 \pm \sqrt{14}i}{2}$. $\frac{a-c}{d} = \frac{-2-14}{2} = -8$

8. E $\frac{1}{2}$
Since the body would cool towards the room temperature, we would have a function that sets up like

this: $y = a(b)^x + 20$. We know the initial value was 100 degrees, so we plug in 0 for x and 100 for y and determine a to be 80.

9. D

In total, there are 8 choose 3 possibilities. And we have 2 choose 1 times 5 choose 2 ways to do this, so we have the following expression: $\frac{2!5!5!3!}{1!1!3!2!8!} = \frac{5}{14}$

10. A

First, let's evaluate all the key players:

$f(0) = 100$	$f(2) = 98$	$f(4) = 92$	$f(6) = 90$	$f(36) = 70$	$f(46) = 60$	$f(76) = 0$

Next, let's calculate average rates of change:

$\frac{92-98}{4-2} = -3$	$\frac{90-98}{6-2} = -2$	$\frac{60-70}{46-36} = -1$	$\frac{0-70}{76-36} = -\frac{7}{4}$

11. A

This would start out simplifying to $\frac{-4x^5+2x^4-8x^3+7x^2+6}{x^3+2x+1}$. Doing a simple division, we get $-4x^2 + 2x + \frac{7x^2-2x+6}{x^3+2x+1}$.

12. E (5)

$$|2x-1| = 6\sqrt{\frac{1}{4}x+1}$$
$$(2x-1)^2 = 36\left(\frac{1}{4}x+1\right)$$
$$4x^2 - 4x + 1 = 9x + 36$$
$$4x^2 - 13x - 35 = 0$$
$$(4x+7)(x-5) = 0$$
$$x = -\frac{7}{4}\ or\ 5$$

13. B
Pascal's triangle is a visual way to look at combinations. Since we want the 15th term of the 83rd row, we could use either $\binom{83}{15}$ or $\binom{83}{68}$ to have the right coefficient. After that, the first term should be to the 15th power and the second one would be to the 68th power. Since it is an even power, the negative with the seven is not needed, because we could quickly simplify that.

14. B

This one seems clear cut. After all, B was clearly the sum using the infinite geometric series formula.

15. D

This is the fundamental theorem of algebra. The degree of a polynomial determines the number of complex roots when multiplicity is included.

16. C

We know that $P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$. So $.35 = .12 + B - .05$. Therefore, B is 28%.

17. C

$\log(38) = \log(2) + \log(19) = a + \log\left(2^{\log_2 19}\right) = a + a(\log_2(19))$

18. A

In this sequence is three separate arithmetic sequences.

5, 3, 1, … $-2n + 7$, $25(5 - 93)$

8, 6, 4, … $-2n + 10$, $25(8 - 90)$

4, 2, 0, … $-2n + 6$, $25(4 - 94)$

So in total, we have $25(-260) = -6500$.

19. B

We need to be able to see the biweekly rate, so, we can rewrite this expression using the properties of exponents. I want it to happen so that even if x is a week, the function only changes every two weeks. So, we need to be able to divide the x values by two to make them happen less often. This means we will have $4(16^2)^{\frac{x}{2}}$.

20. B

$(4x - 1) - (3x - 3)^3 = 4x - 1 - 27x^3 + 81x^2 - 81x + 27$, so the linear term is $-77x$

21. B

Part A has a vertex of $(2.5,3)$

Part B, if we were to complete the square, would have an equation of $y = (x - 2.5)^2 + 2.75$. This vertex is located at $(2.5,2.75)$.

Part C has a vertex of $(2.5,3)$.

Part D, if we were to complete the square, would have an equation of $x = (y - 3)^2 + 2.5$. This vertex is located at $(2.5,3)$.

22. A

$$d = \frac{180}{\pi} r$$
$$d = \frac{180}{\pi}(4) = \frac{720}{\pi}$$

23. B

$$y = a(x-2)^2(x+1)^3(x-5)$$
$$3 = a(-2)^2(1)^3(-5)$$
$$3 = -20a$$
$$a = -\frac{3}{20}, b = 3$$
$$So, -\frac{3}{10} - \frac{15}{10} = -\frac{18}{10} = -1.8$$

24. B

All of the other three simplify to $2|x-1|$, except this one.

25. A

$$0 = \ln(2x) + \ln\left(\frac{x-5}{3}\right)$$
$$\ln\left(\frac{x-5}{3}\right)^{-1} = \ln(2x)$$
$$\frac{3}{x-5} = 2x$$
$$3 = 2x^2 - 10x$$
$$2x^2 - 10x - 3 = 0$$
$$x = \frac{10 \pm \sqrt{100+24}}{4} = \frac{10 \pm 2\sqrt{31}}{4} = \frac{(5 \pm \sqrt{31})}{2}$$

However, the negative value would be extraneous, because the first logarithm clearly cannot have a negative value.

26. B

Plugging in the points from the table into a general quadratic form, we get the system of equations:

$$\begin{cases} 4a - 2b + c = 5 \\ a + b + c = -2.5 \\ 4a + 2b + c = -3 \end{cases}$$

Solving this system, we find that it came from the equation $f(x) = \frac{1}{2}x^2 - 2x - 1$.

Therefore, looking at the y-intercept values, we find h is at $-\frac{64}{125}$. G is at -1.5, and f is at -1. So the order from least to greatest would be g, f, h

27. E (6)

For complex numbers to be equivalent, the real and imaginary parts much equal each other. With this information, we set up the following system of equations.

$$\begin{cases} -7 + x = -2y \\ -x + \frac{3}{7} + \frac{9}{7}y = 0 \end{cases}$$

Using substitution, we can find that $2y - 7 + \frac{3}{7} + \frac{9}{7}y = 0, so\ y = 2\ and\ x = 3.$

28. B

For this problem, it is easier to think about this as follows. The values for y should represent the highest and lowest values that they can take on. So if we for the x expression to zero out, we get $(y - 1)^4 = 16$. Solve this for y to get the answer of -1 and 3, which is the range.

29. E (It's symmetric to all of them).

A. $\frac{1}{x^2} + \frac{1}{(-y)^2} = 1$ is the same as $\frac{1}{x^2} + \frac{1}{y^2} = 1$, so it is symmetric to the x-axis.

B, C. A very similar argument holds for symmetry to the y axis as well as origin.

D. Switching x and y yields the same expression, and so it is its own inverse. Therefore, it is symmetric to $y = x$.

30. D

The common ratio here is $-\frac{2}{3}$. So we get the expression $\frac{\left(162\left(1-\left(-\frac{2}{3}\right)^{1000}\right)\right)}{\frac{5}{3}}$. Since the fraction is to such a high power, this should be nearly indistinguishable from 1. So it simplifies to 97.2.