Non-linear Equation Graphs Answer Key

1. **B.** Graphs of rational equations in the form $y=\frac{a}{x-k}+h$, where a, k, and h are constants and k≠x, have the line x = k as a vertical asymptote and the line y = h as a horizontal asymptote. The graph of $y=\frac{6}{x+1}$ has a vertical asymptote at $x=-1$ and a horizontal asymptote at $y=0$. The graph of $y=\frac{6}{x+1}-3$ has a vertical asymptote at $x=-1$ and a horizontal asymptote at $y=-3$. The only true statement is both graphs have a vertical asymptote at $x=-1$. Choices A, C, and D are incorrect because they all do not contain true information about graphs of the two equations.

2. **A**. To be a solution to a system of equations, an order pair must satisfy all equations in the system. Graphically, this implies that the ordered pair must be a point on the graphs of all the equations in the system, or a point that lies at the intersection of the graphs of all the equations in the system. Looking at the graph, only the point (-1,2) is the only point where all three graphs intersect. Choice B is incorrect because only $y=-x^2+4$ and $y=x+4$ intersect at that point. Choice C is incorrect because it flips the x and y coordinates. Choice D is incorrect because (0,4) is not a solution to the system of equations.

3. **A**. Graphically, it appears that there are two intersection points at (6,8) and (-10,0). To verify which one is correct, we plug the points into the initial equations.

$$6^2+8^2=36+64=100$$
$$8=2^{6-3}=2^3=8$$

The point (6,8) is a solution to the system.

$$\left(-10\right)^2+0^2=100$$

$0\neq 2^{-10-3}=2^{-13}=\frac{1}{8192}$ which although is very small, isn't quite equal to zero. Thus, the better solution would be the point (6,8).

Choices B and D are incorrect because there are no intersections at those points. Choice C is incorrect because although it appears to be a solution on the graph, when plugged into the equations, and although it produces a very small answer, it is not equal to zero. Thus, choice A is the best answer.

4. **C**. To be a solution to a system of equations, an ordered pair must satisfy all the equation in the system. In other words, it must be a point of intersection for all three graphs. There is only one point of intersection for all three equations, thus, there is 1 solution to this system of equations. Choices A, B, and D are incorrect because none of them have the correct number of solutions to the system.

5. **D**. Looking at the graph, it is clear that there are two points of intersection and thus two solutions to the system of equations. One of them is (2, 6). Another potential answer is (4.5, 4.5). To check, we plug these points into the original equations.

$$6=-4\left(2-3\right)^2+10=-4\left(1\right)+10=-4+10=6$$
$$6=0.5^{2-3}+4=0.5^{-1}+4=2+4=6$$

Thus (2,6) is a solution. If we plug in (4.5, 4.5), we will not get a solution. Thus, the answer is D, (2, 6). Choice A is incorrect because it flips the x and y coordinates of the correct solution. Choices B and C are incorrect because there is no intersection at those points.

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6. **B**. If the graph of a parabola passes through a point $(-2,1)$, then the ordered pair $(-2,1)$ must satisfy the equation of the parabola. Thus $1=a(-2)^2+b(-2)+c=4a-2b+c$. Choices A, C, and D are incorrect and may be due to algebra errors.

7. **C**. $f(-x)=2^{-(-x)}+1=2^x+1$ which is a basic exponential equation represented by the graph in option C. Choice A is incorrect because it represents the graph of $f(x)=2^{-x}+1$. Choice B is incorrect because it represents the graph $f(x)=2^{-x}-1$. Choice D is incorrect because it represents the graph $f(x)=-2^{-x}-1$.

8. **C**. A zero of a function corresponds to an x-intercept of the graph of the function in the xy -plane. Therefore, the complete graph of the function f, which has four distinct zeros, must have four x-intercepts. Only the graph in choice C has four x-intercepts, and therefore is the only one of the given graphs that could be the complete graph of f in the xy -plane. Choice A is incorrect because it has 5 roots. Choice B is incorrect because it has 2 roots. Choice D is incorrect because it has 1 root.

9. **C**. When x=0, then y equals the constant term, giving us the ordered pair of (0, k), where k represents the constant term. This ordered pair is also the y-intercept of the graph. Choices A, B, and D are all incorrect because none of them are represented by the constant of an equation.

10. **B**. Set the two equations equal to each other to get $2x^2-9x=x \rightarrow 2x^2-10x=0 \rightarrow 2x(x-5)=0$. Thus, we get $x=0$ and $x=5$. Thus, a = 5. Choices A, C, and D are all incorrect potentially due to algebra errors.