

Solution Sets, Line-Parabola Systems and Exponentials

Grade 9 – Algebra 1 math · Test Answer Key · Standards: A-REI.D.10, A-REI.C.7, F-IF.C.7e, A-SSE.B.3c

Use this answer key to score the test out of 20 points. Each solution lists where points are earned. Accept coordinates written as ordered pairs, and give partial credit when a correct equation contains an arithmetic slip.

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Question 1 Points on a Parabola (2 points)

$(2, -3)$: $4 - 4 - 3 = -3$ ✓. $(-1, 2)$: $1 + 2 - 3 = 0$, not 2. $(4, 5)$: $16 - 8 - 3 = 5$ ✓.

$(2, -3)$ and $(4, 5)$

Scoring: 1 point for checking all three points, 1 point for the correct choice.

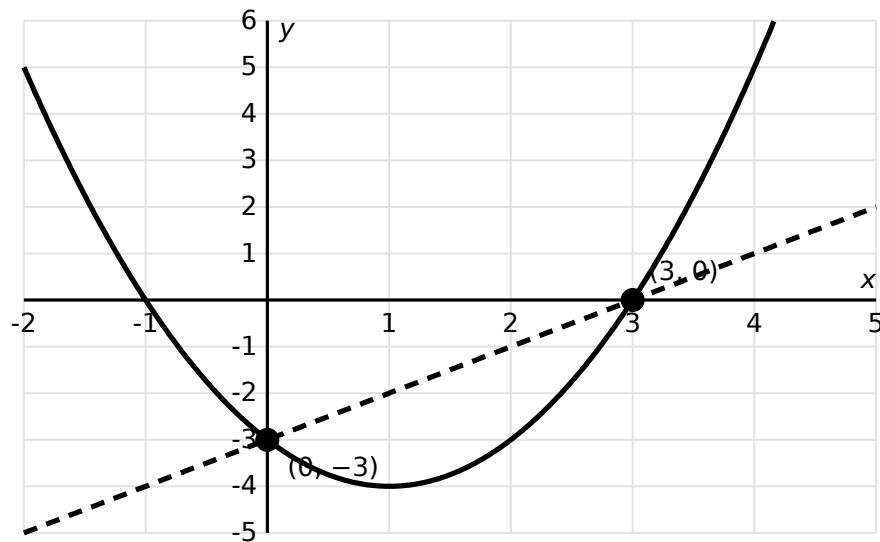
Question 2 Line and Parabola (3 points)

- a. $x^2 - 4x + 3 = x - 1$, or $x^2 - 5x + 4 = 0$.
- b. $(x - 1)(x - 4) = 0$, so $x = 1$ or $x = 4$.
- c. $y = x - 1$ gives 0 and 3: **$(1, 0)$ and $(4, 3)$** .

Scoring: 1 point per part.

Question 3 Estimate Then Confirm (3 points)

- a. The graphs cross near **$(0, -3)$ and $(3, 0)$** .
- b. $x^2 - 2x - 3 = x - 3$ gives $x^2 - 3x = 0$, so $x(x - 3) = 0$ and $x = 0$ or $x = 3$. Then $y = x - 3$ gives -3 and 0 : **$(0, -3)$ and $(3, 0)$** .



Intersections at $(0, -3)$ and $(3, 0)$.

Scoring: (a) 1 point. (b) 1 point for the equation and factoring, 1 point for both points.

Question 4 No Intersection (2 points)

$x^2 + 1 = 2x - 3$, so $x^2 - 2x + 4 = 0$. The discriminant is $4 - 16 = -12$, which is negative.

There is no real solution, so the graphs never meet.

Scoring: 1 point for the equation, 1 point for the discriminant and conclusion.

Question 5 Exponential Graph (3 points)

- The graph crosses the y-axis at **(0, 5)** and the values halve each step: **$y = 5(\frac{1}{2})^x$** .
- As $x \rightarrow \infty$, $y \rightarrow 0$; as $x \rightarrow -\infty$, $y \rightarrow \infty$.
- $5(\frac{1}{2})^{-5} = 5 \cdot 32 = \mathbf{160}$.

Scoring: 1 point per part.

Question 6 Monthly Growth Factor (3 points)

- $A = 800(1.12^{1/12})^{12t} \approx \mathbf{800(1.0095)^{12t}}$. The monthly factor is about **1.0095**, a rate of about 0.95%.
- $t = 0.5$: $800(1.12)^{0.5} = 800(1.0583) \approx \mathbf{\$846.64}$.

Scoring: (a) 1 point for the power rule, 1 point for the factor. (b) 1 point.

Question 7 System Solution Check (2 points)

Check (3, 9): $3^2 = 9$ ✓ and $4(3) - 3 = 9$ ✓. The other solution comes from $x^2 = 4x - 3$, so $x^2 - 4x + 3 = 0$ and $(x - 1)(x - 3) = 0$, giving $x = 1$ and $y = 1$.

The other solution is (1, 1).

Scoring: 1 point for the check, 1 point for the other solution.

Question 8 Rewrite an Exponent (2 points)

$$5^{x+2} = 5^x \cdot 5^2 = \mathbf{25 \cdot 5^x}.$$

At $x = 1$: $25 \cdot 5 = \mathbf{125}$. Check: $5^3 = 125$.

Scoring: 1 point for the form $25 \cdot 5^x$, 1 point for the value.