

Solution Sets, Line-Parabola Systems and Exponentials

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

Name: _____ Date: _____ Class: _____

These 20 problems train standards A-REI.D.10, A-REI.C.7, F-IF.C.7e and A-SSE.B.3c. The first problems test points against equations and evaluate exponential functions. Later problems solve a line with a parabola, graph exponentials and rewrite exponents.

The last six problems apply these ideas to ramps, savings, half-life and exact intersections.

Standards: A-REI.D.10, A-REI.C.7, F-IF.C.7e, A-SSE.B.3c · **Level:** Grade 9 Algebra 1

Problem 1 Test Two Points on a Line (easy)

Decide whether each point is on the graph of $y = 2x + 5$: (3, 11) and (−1, 4).

Problem 2 Test Three Points on a Parabola (easy)

Decide which of the points (4, 10), (−3, 3) and (2, −1) are on the graph of $y = x^2 - 6$.

Problem 3 Complete the Solution Pair (easy)

Find the missing coordinate so that each point is on the graph.

- a. (4, ?) on $y = 3x - 7$
- b. (−3, ?) on $y = x^2 + 2x$

Problem 4 Growth y-Intercept and a Value (easy)

For $y = 5(2)^x$, give the y-intercept and the value at $x = 3$. Does the graph rise or fall as x increases?

Problem 5 Decay y-Intercept and a Value (easy)

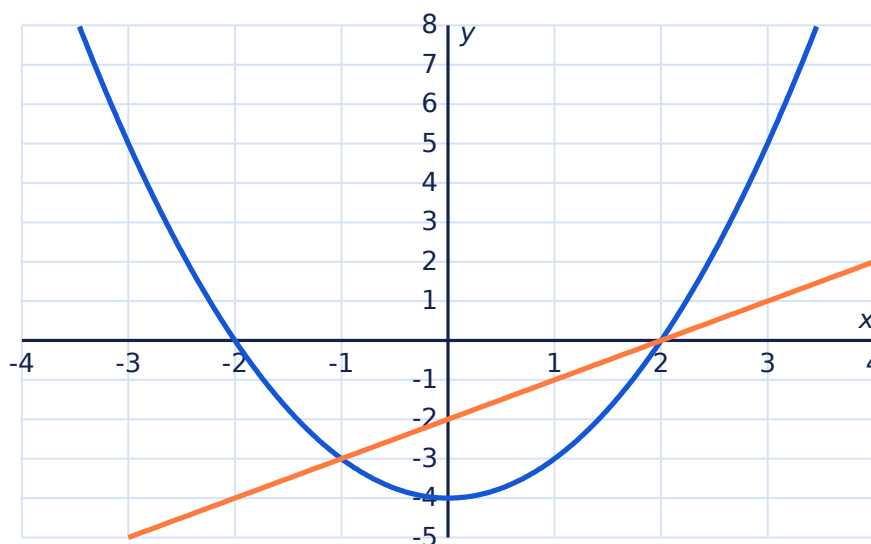
For $y = 80(\frac{1}{2})^x$, give the y-intercept, the value at $x = 3$ and the horizontal asymptote.

Problem 6 Negative Inputs (easy)

For $y = 6(3)^x$, find y when $x = -1$ and when $x = -2$.

Problem 7 Find Intersections from a Graph (medium)

The graph shows $y = x^2 - 4$ and $y = x - 2$. Estimate the intersection points, then confirm them algebraically.



A parabola and a line.

Problem 8 Substitution with $y = x^2$ (medium)

Solve the system $y = x^2$ and $y = 2x + 8$.

Problem 9 System with a Missing Constant Term (medium)

Solve the system $y = x^2 - x - 6$ and $y = 2x - 6$.

Problem 10 Exactly One Solution (medium)

Solve the system $y = x^2 - 6x + 10$ and $y = 2x - 6$. What does the number of solutions tell you about the graphs?

Problem 11 No Solution (medium)

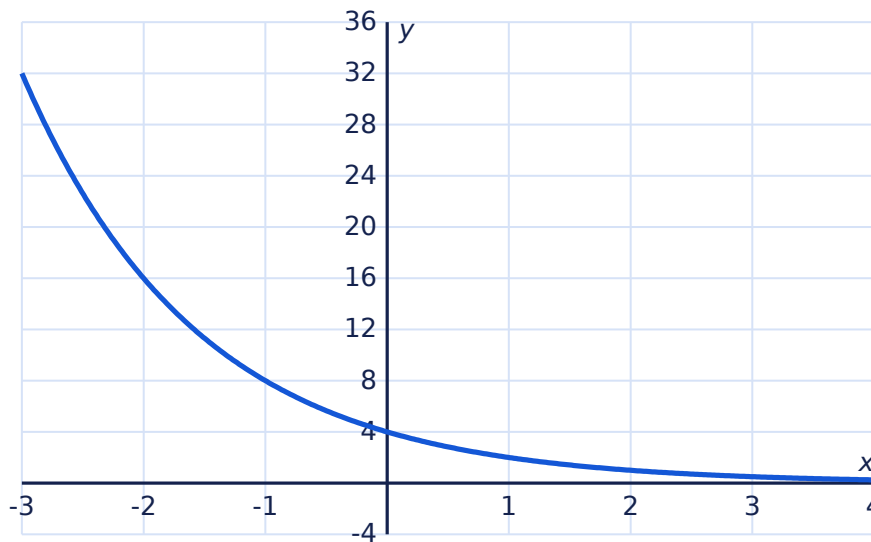
Show that the system $y = x^2 + 3$ and $y = 2x$ has no real solution.

Problem 12 Tangent Condition (medium)

For what value of c does the line $y = 2x + c$ touch the parabola $y = x^2$ at exactly one point? Find that point.

Problem 13 Read an Exponential Graph (medium)

The graph shows an exponential function. Give its y-intercept, its horizontal asymptote and its end behavior as $x \rightarrow \infty$ and as $x \rightarrow -\infty$. Write its equation.



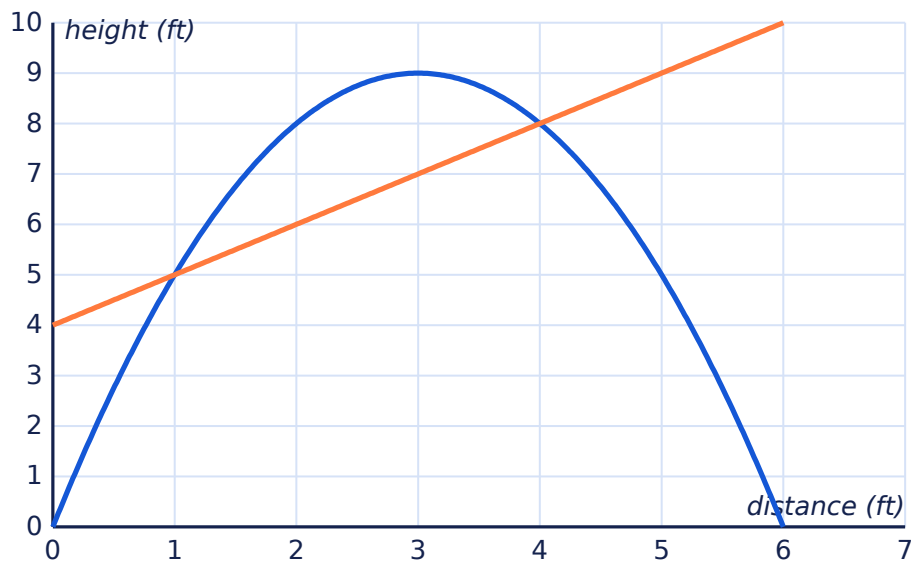
A decay curve.

Problem 14 Rewrite with the Power Rule (medium)

Rewrite $100(1.08)^t$, where t is in years, so that the exponent counts months, $n = 12t$. Find the monthly growth factor to four decimal places.

Problem 15 Ball Over a Ramp (hard)

A ball follows the path $h = -x^2 + 6x$, and a ramp is the line $h = x + 4$ (both in feet). Find where the ball path meets the ramp.



Ball path and ramp line.

Problem 16 Solve and Check Both Equations (hard)

Solve $y = x^2 - 2x - 8$ and $y = -x + 4$. Check each solution in both equations.

Problem 17 Monthly Rate for a Savings Account (hard)

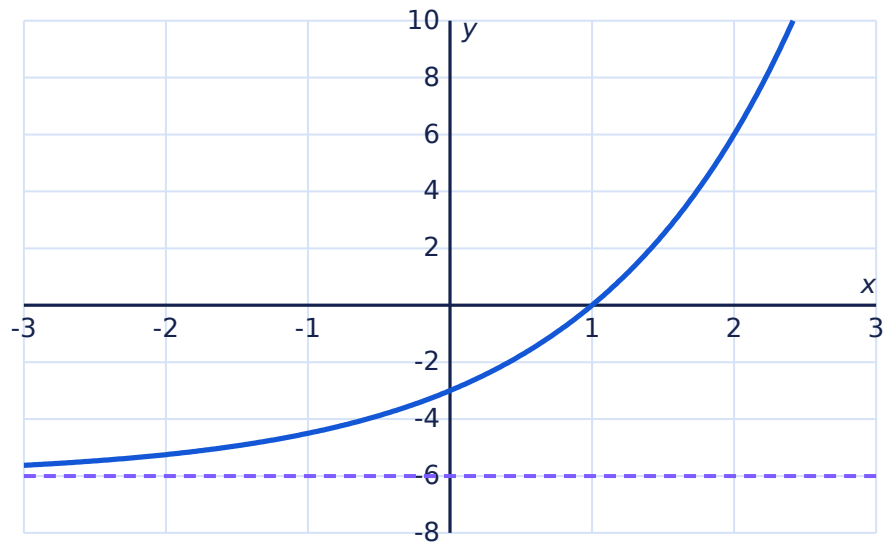
An account grows by 6% each year: $A = 1500(1.06)^t$. Rewrite it with an exponent that counts months, find the monthly growth rate (to the nearest hundredth of a percent) and find the balance after 18 months.

Problem 18 Half-Life as Yearly Decay (hard)

A radioactive sample has mass $M = 200(\frac{1}{2})^{\frac{t}{5}}$ grams after t years. Rewrite it as $200b^t$, find the yearly decay rate to the nearest tenth of a percent and find the mass after 10 years.

Problem 19 Intercepts and End Behavior (hard)

The graph shows $f(x) = 3(2)^x - 6$. Find the y-intercept and the x-intercept, name the horizontal asymptote and describe the end behavior as $x \rightarrow \infty$ and $x \rightarrow -\infty$.



An exponential graph with a dashed horizontal line.

Problem 20 Irrational Intersection Points (hard)

Find the intersection points of $y = x^2$ and $y = 2x + 1$. Give exact coordinates for the x-values and decimals to the nearest hundredth.