Algebra 2 Unit 1 test: Parent functions and transformations

Name _____ Date _____ Period _____

12 questions, 46 points

1. The graph of $g(x) = x^2 - 4x$ is drawn only from a closed dot at $x = -1$ to an open dot at $x = 5$. Its lowest point is $(2, -4)$. (3 points)

(a) Use the rule to find the coordinates of both end dots.

(b) Find the domain and range of the graph in interval notation.

2. The graph of g is a vertical stretch or compression of $y = \frac{1}{x}$ and passes through $\left(4, \frac{3}{4}\right)$. (3 points)

(a) Write the rule for g and name the move.

(b) Find every point where the graph of g meets the line $y = x$. Give exact coordinates.

3. Let $g(x) = 2\,f(x - 1) + 3$ and $m(x) = -g(x + 4) - 1$. (3 points)

(a) Write $m(x)$ in the form $a\,f\big(b(x - h)\big) + k$ and give a, b, h and k.

(b) The point $(2, -5)$ is on the graph of f. Find the point of m that comes from it twice: once by going through g, and once by using your rule from (a).

4. Diego draws one curve from two parent graphs: for $x \le 0$ it follows $y = x^2$, and for $x > 0$ it follows $y = x^3$. (4 points)

(a) Give the domain and range of his curve.

(b) Where does the curve fall and where does it rise? What is its lowest point?

(c) Find every input whose output is 64.

(d) Is the curve its own mirror image in the y-axis? Use the inputs -2 and 2 to explain.

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5. Compare the parent graphs $y = |x|$ and $y = \dfrac{1}{x}$. (4 points)

(a) Find every x with $|x| = \dfrac{1}{x}$.

(b) Find every $x \neq 0$ with $|x| > \dfrac{1}{x}$.

Treat $x < 0$ and $x > 0$ separately.

6. Let $g(x) = \dfrac{1}{x - 4} + 5$. (4 points)

(a) Give the asymptotes of the graph of g.

(b) Give the domain and the range of g.

(c) Find the x-intercept and the y-intercept of the graph.

7. Let $f(x) = (x - 2)^3 + 1$. Its graph is $y = x^3$ shifted so that the point (0, 0) of the parent lands at (2, 1). (4 points)

(a) For $g(x) = -f(x)$: write the rule, say where the point (2, 1) goes, and find the x-intercept and the y-intercept.

(b) For $h(x) = f(-x)$: write the rule, say where the point (2, 1) goes, and find the x-intercept and the y-intercept.

8. The graphs of $y = 2|x - 1| - 4$ and $y = -|x - 1| + 2$ enclose a region with four corners. (4 points)

(a) Find the four corners.

(b) Find the area of the region.

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9. A ride-share app shows the fare $F(d)$, in dollars, for a ride of d kilometers. (4 points)

d (km)	3	7	12	20
$F(d)$ (dollars)	11.10	18.30	27.30	41.70

(a) Find the average rate of change of F over each interval between neighboring columns, and explain why the table fits a linear function.

(b) Write $F(d)$ and say what both of its numbers mean, with their units.

(c) How long a ride has a fare of 47.10 dollars?

10. A parabola has its vertex at $(2, 5)$ and passes through $(4, -3)$. (4 points)

(a) Write its rule in the form $y = a(x - h)^2 + k$.

(b) Sofia wants to write the rule with a horizontal compression instead, as $y = -\big(b(x - 2)\big)^2 + 5$. She takes $b = 2$, "because a was 2 apart from its sign". Test her rule at $(4, -3)$, and find every value of b that works.

(c) Explain why the graph cannot tell you the sign of b, and check one of your rules from (b) at the point $(0, -3)$.

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11. Here is a table for a function w. Its graph turns onto itself under a half turn about some point, but that point is not the origin. (4 points)

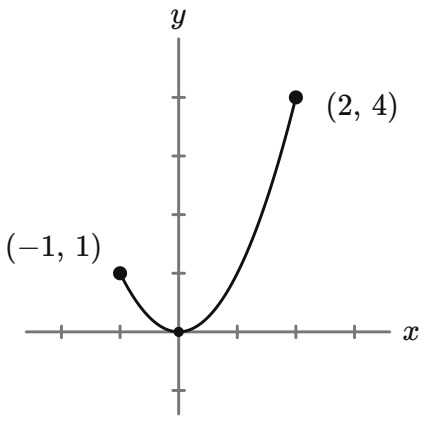
x	-2	-1	0	1	2	3	4
$w(x)$	-17	-2	1	-2	-5	-2	13

(a) Use one entry to show that the graph of w is not symmetric about the origin.

(b) Pair up the entries to find the center of the half turn.

(c) Find numbers h and c so that the graph of $m(x) = w(x + h) + c$ is symmetric about the origin, and give the table of m for $x = -3$ to 3.

12. The figure shows the whole graph of a function f: the part of the parabola $y = x^2$ from the closed dot $(-1, 1)$ to the closed dot $(2, 4)$, passing through its vertex $(0, 0)$. Let $g(x) = 3 - f(2x)$. (5 points)



(a) Carry the two endpoints and the vertex to the graph of g, and sketch the graph of g.

(b) Give the domain and range of g in interval notation.

(c) Sofia says the range of g runs from the height of one endpoint of its graph to the height of the other. Explain why she is wrong.

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