

AP Precalculus

Combined Function Transformations

Combined Function Transformations | APPC-U01-P18

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
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Topic focus

Across 96 tasks this topic asks for determinate or not, g from f , two maps, coordinate rules, equivalence and equivalence proof.

8 PDFs and a README; 70 buyer pages.

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Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Normalize $g(x) = 3f(6x + 15) - 2$ and state h. Bank label: _____	Normalize the inside of $g(x) = (\frac{3}{2})f(-0.4x - 2) + 1$ and state b, h. Bank label: _____
Double all x-coordinates of f, then shift the current graph left 3. Write $g(x)$. Bank label: _____	Function f has domain $[-3, 9)$ and range $(0, 8]$. Find both sets for $g(x) = (\frac{1}{2})f(\frac{x-7}{4}) - 3$. Bank label: _____

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Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Starting from f, shift the graph right 3 units and then double every x-coordinate. Write the final rule $g(x)$. _____ _____	Function f has vertex $(0, -2)$ and domain $[-4, 4]$. Construct $g(x) = a f(b(x-h)) + k$ with $a > 0, b > 0$ so the vertex becomes $(3, 5)$ and domain becomes $[1, 5]$. _____ _____
Let $f(u) = u + 1$ for $u < 0$ and $f(u) = u^2$ for $u \geq 0$. Write $g(x) = 2f(3(x-4)) - 5$ as a piecewise function of x. _____ _____	Normalize $g(x) = -4f(-2x - 6) + 1$ and give a, b, h, k and the coordinate map. _____ _____

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Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: $(3, 0)$ Under (u, v) to $(h + \frac{u}{b}, k + av)$ with $a, b > 0$, source points $(0, 1), (4, 3)$ map to $(2, -1), (4, 5)$. Find a, b, h, k. Complete response required: a, b, h, k. <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 25%;">2</td><td style="width: 25%;">-1</td><td style="width: 25%;">0</td><td style="width: 25%;">1</td></tr> <tr> <td>4</td><td>5</td><td>4</td><td>3</td></tr> </table> Your response: _____	2	-1	0	1	4	5	4	3	Incoming: Domain $[-20, -8]$ union $\{-2\}$ union $(8, 16]$; range $[-8, 4]$ union $(16, \infty)$. The graph of f has vertical asymptote $x = -2$. Find the corresponding vertical asymptote of $g(x) = 3f(2(x - 5)) + 4$. Your response: _____								
2	-1	0	1														
4	5	4	3														
Incoming: $y = 3$. Under (u, v) to $(h + \frac{u}{b}, k + av)$ with $a, b > 0$, $(-3, 2), (5, 6)$ map to $(1, 7), (3, 15)$. Find a, b, h, k. Complete response required: a, b, h, k. <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 25%;">1</td><td style="width: 25%;">7</td><td style="width: 25%;">-3</td><td style="width: 25%;">2</td></tr> <tr> <td>3</td><td>15</td><td>5</td><td>6</td></tr> </table> Your response: _____	1	7	-3	2	3	15	5	6	Incoming: $a = 2, b = -3, h = 5, k = -2$. Under an affine graph map, $(0, 0)$ maps to $(-2, 5)$ and $(6, 4)$ maps to $(1, -3)$. Find a, b, h, k. Complete response required: a, b, h, k. <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 25%;">-2</td><td style="width: 25%;">5</td><td style="width: 25%;">0</td><td style="width: 25%;">0</td></tr> <tr> <td>1</td><td>-3</td><td>6</td><td>4</td></tr> </table> Your response: _____	-2	5	0	0	1	-3	6	4
1	7	-3	2														
3	15	5	6														
-2	5	0	0														
1	-3	6	4														
Incoming: $a = -2, b = 2, h = -2, k = 5$. Rewrite $g(x) = 2f(3(x + 1)) + 5$ if $f(u) = 4$ for $u < 2$ and $f(u) = u - 1$ for $u \geq 2$. Your response: _____	Incoming: $g(x) = 13$ for $x < -\frac{1}{3}$; $g(x) = 6x + 9$ for $x \geq -\frac{1}{3}$. Under an affine graph map, $(0, 2), (10, -3)$ map to $(4, 1), (9, 11)$. Find a, b, h, k. Complete response required: a, b, h, k. <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 25%;">4</td><td style="width: 25%;">1</td><td style="width: 25%;">0</td><td style="width: 25%;">2</td></tr> <tr> <td>9</td><td>11</td><td>10</td><td>-3</td></tr> </table> Your response: _____	4	1	0	2	9	11	10	-3								
4	1	0	2														
9	11	10	-3														

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Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Shift f down 2, reflect the current graph across the x -axis, then triple outputs. Write $g(x)$. A student reports $g(x) = -3f(x) - 6$. Locate the sign or order-of-operations error, write the corrected intermediate calculation or coordinate map, and give the correct complete result.

Shift f left 2, triple current x -coordinates, reflect across the y -axis, then shift right 1. Write $g(x)$. A student reports $g(x) = f(\frac{-x-5}{3})$. Locate the sign or order-of-operations error, write the corrected intermediate calculation or coordinate map, and give the correct complete result.

Double outputs of f , reflect the current graph across the x -axis, then shift up 7. Write $g(x)$. A student reports $g(x) = -2f(x) - 7$. Locate the sign or order-of-operations error, write the corrected intermediate calculation or coordinate map, and give the correct complete result.

Halve x -coordinates of f , shift the current graph right 4, then reflect across the y -axis. Write $g(x)$. A student reports $g(x) = f(-2x + 8)$. Locate the sign or order-of-operations error, write the corrected intermediate calculation or coordinate map, and give the correct complete result.

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Full Worked Solutions - excerpt

Worked example

Problem. For nonzero q , normalize $g(x)=A f(qx-r)+K$ as $A f(q(x-h))+K$.

Answer. $h=r/q$, so $g(x)=A f(q(x-r/q))+K$.

Explanation and check.

Expand $q(x-r/q)=qx-r$.

Worked example

Problem. Function $f(d)$ gives euros d days after Jan 1. Define $g(w)$ for cents w weeks after Jan 8, using 110 cents per euro.

Answer. $g(w) = 110f(7 + 7w)$.

Explanation and check.

Jan 8 is day 7, and each new unit adds 7 days.