

Function Composition and Inverses: math test solutions, Grade 12 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Compositions

/ 4 pts

(a) $(f \circ g)(x) = (3x + 1)^2 - 4(3x + 1) = 9x^2 + 6x + 1 - 12x - 4 = 9x^2 - 6x - 3$.
(1.5 pts)

(b) $(g \circ f)(x) = 3(x^2 - 4x) + 1 = 3x^2 - 12x + 1$. (1 pt)

(c) $9 - 6 - 3 = 0$. Check: $g(1) = 4$, $f(4) = 0$. (0.5 pt)

(d) $9x^2 - 6x - 3 = 0$ gives $3x^2 - 2x - 1 = 0$, that is $(3x + 1)(x - 1) = 0$. So $x = 1$ or $x = -\frac{1}{3}$. (1 pt)

2 Domains of composites

/ 3 pts

$(f \circ g)(x) = \sqrt{5 - x^2}$. We need $5 - x^2 \geq 0$, so the domain is $[-\sqrt{5}, \sqrt{5}]$. (1.5 pts)

$(g \circ f)(x) = 6 - (\sqrt{x - 1})^2 = 7 - x$, with domain $[1, \infty)$ because f needs $x \geq 1$. (1.5 pts)

3 A rational inverse

/ 4 pts

(a) $y(x - 1) = 2x + 5$ gives $xy - y = 2x + 5$ and $x(y - 2) = y + 5$. So

$$f^{-1}(x) = \frac{x + 5}{x - 2}. \text{ (2.5 pts)}$$

$$(b) f(f^{-1}(x)) = \frac{\frac{2(x+5)}{x-2} + 5}{\frac{x+5}{x-2} - 1} = \frac{7x/(x-2)}{7/(x-2)} = x. \text{ (1 pt)}$$

(c) Domain: $x \neq 1$. The range is the domain of f^{-1} : $y \neq 2$. (0.5 pt)

4 A restricted inverse

/ 3 pts

$f(x) = (x - 3)^2 - 5$, range $[-5, \infty)$. (1 pt)

$y = (x - 3)^2 - 5$ with $x \geq 3$ gives $x = 3 + \sqrt{y + 5}$. So $f^{-1}(x) = 3 + \sqrt{x + 5}$, domain $[-5, \infty)$. (1 pt)

$f^{-1}(11) = 3 + 4 = 7$ and $f(7) = 49 - 42 + 4 = 11$. (1 pt)

5 Transforming a root graph

/ 3 pts

(a) Shift left 3, stretch vertically by 2, shift down 4. Domain $[-3, \infty)$, range $[-4, \infty)$. (1.5 pts)

(b) $g(x) = 0$: $\sqrt{x + 3} = 2$, so $x = 1$. y-intercept: $g(0) = 2\sqrt{3} - 4 \approx -0.54$. (1.5 pts)

6 Symmetry and pieces

/ 3 pts

(a) $f(-x) = -x^5 - 3x = -f(x)$: odd. $g(-x) = x^4 - |x| = g(x)$: even. $h(1) = 4$ and $h(-1) = 0$: neither. (1.5 pts)

(b) If $x < 1$, $|x - 1| = 1 - x$, so $k(x) = 1$. If $x \geq 1$, $k(x) = (x - 1) + x = 2x - 1$. (1.5 pts)



Test yourself: quick challenge for Grade 12

[Change level](#)

Level : **Grade 12**

6 random questions, instant feedback.



Start the challenge



Keep exploring with Zyro



Math tests

Function Composition and Inverses: math test, Grade 12



Math lessons

Function Composition and Inverses: math lesson, Grade 12



Math quizzes



Math tests

Function Composition and Inverses: math quiz, Grade 12

Trigonometric Functions and the Unit Circle: math test, Grade 12



Math tests

Graphs of Trigonometric Functions: math test, Grade 12



Math lessons

Trigonometric Functions and the Unit Circle: math lesson, Grade 12

Zyro takes you to our partner sites

Blast off to other planets of knowledge and their apps.

Lift off