Solutions

1.1 Function Notation, Domain, and Range

1.1.1. Find the domain of $f(x) = 1/(x+3)$.

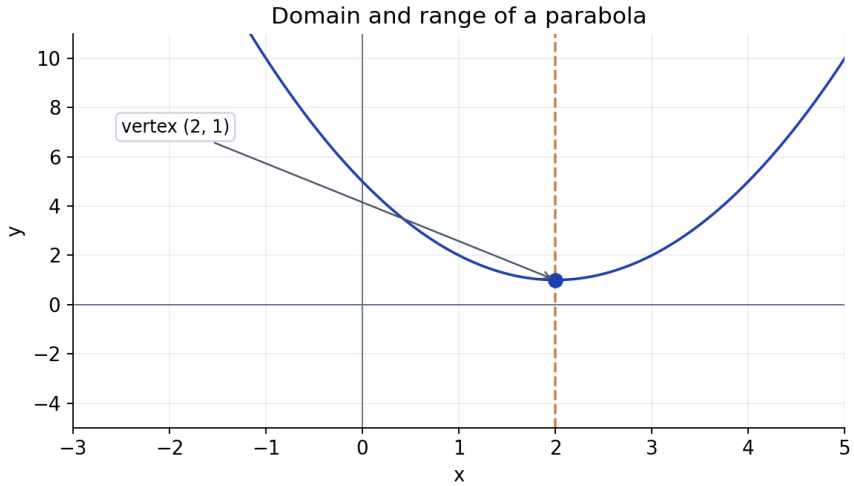
Solution. The denominator cannot be zero, so $x \neq -3$. The domain is all real numbers except -3.

1.1.2. Find the domain of $g(x) = \sqrt{7-2x}$.

Solution. $7 - 2x \geq 0$, giving $x \leq 7/2$. The domain is $(-\infty, 7/2]$.

1.1.3. Use the graph of $f(x) = (x-2)^2 + 1$ to give its domain and range.

Solution. Every real input is allowed, so the domain is $\mathbb{R}$. The minimum output is 1, so the range is $[1, \infty)$.



Domain: all real numbers; range: y ≥ 1.

Solutions

1.2 Transformations

1.2.1. Describe $y = 3\sqrt{x+1} - 2$ relative to $y = \sqrt{x}$.

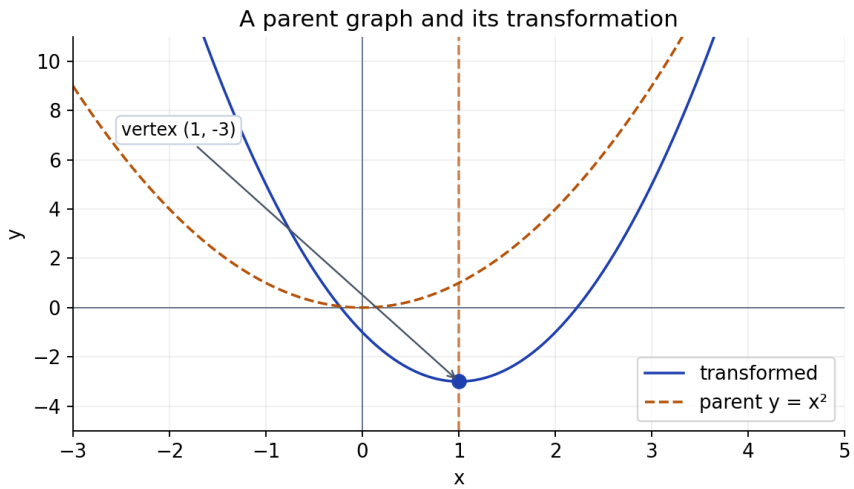
Solution. Shift left 1, stretch vertically by 3, and move down 2. The starting point is $(-1, -2)$.

1.2.2. Transform $y = x^2$ by reflecting across the x-axis and moving down 4.

Solution. The resulting equation is $y = -x^2 - 4$.

1.2.3. Compare the parent graph and transformed graph $y = 2(x-1)^2 - 3$. State its vertex and vertical scale.

Solution. The vertex moves to $(1, -3)$ and the vertical scale factor is 2. The graph opens upward and is narrower than $y = x^2$ at the same output height above its vertex.



The transformed vertex is (1, −3), with vertical scale 2.

Solutions

1.3 Composition and Inverses

1.3.1. For $f(x) = x + 2$ and $g(x) = 3x$, find $(g \circ f)(x)$.

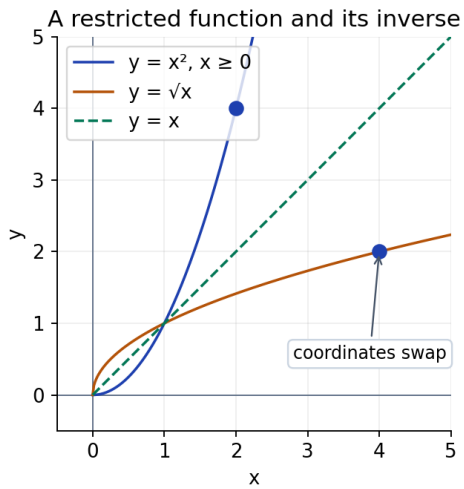
Solution. $g(f(x)) = 3(x + 2) = 3x + 6$.

1.3.2. Find the inverse of $h(x) = (x - 5)/2$.

Solution. From $y = (x - 5)/2$, solve for $x = 2y + 5$. Thus $h^{-1}(x) = 2x + 5$.

1.3.3. The graph shows $y = x^2$ restricted to $x \geq 0$ and its inverse. State the inverse and explain the restriction.

Solution. The inverse is $y = \sqrt{x}$, with domain and range $[0, \infty)$. Restricting the parabola to $x \geq 0$ makes it one-to-one; the graphs reflect across $y = x$.



The inverse is square root of x; both domains are nonnegative.