

Math 115: Precalculus

Have you got these yet?

A. Abstract theory

- Transformation of graphs: shifting, stretching, shrinking, reflecting
- Odd and even functions: Recognizing even/odd functions from their formula and/or their graphs
- Quadratic functions: Shape of quadratic functions; Locating of maxima and minima (vertices) by completing the square
- Composition of functions: Finding compositions; Recognizing compositions
- One-to-one functions: Horizontal line test
- Inverse functions

B. Problems

1. Let $f(x) = x^2$. The graph of another function $g(x)$ is obtained from the graph of $f(x)$ by translating to the left 2 units, shrinking vertically by a factor of 4, reflecting about the y -axis, stretching horizontally by a factor of 2, then finally moving downwards 3 units. Find the expression for $g(x)$.
2. Are the following functions even or odd?
 - $x^2 + x$
 - $x^3 - x$
 - $x^8 - x^2 - x^{-2}$
3. Let $f(x) = 3x^2 + 6x - 9$. Locate the vertex of the graph of $f(x)$. Does the graph of $f(x)$ curve upwards or downwards? Find the maximum and minimum of $f(x)$ over the interval $[-2, 3]$.
4. Let $f(x) = x^2 - x$ and $g(x) = \frac{1+x}{1-x}$. Find the domain and the expression of the composition $f \circ g$.
5. Express the function $f(x) = \sqrt[4]{(x-2)^2 - (x-2)^{-2} + 3}$ as a composition of simpler functions.
6. Check whether the functions $f(x) = x^2$, $g(x) = x^3$ are one-to-one.
7. Show that the function $f(x) = \frac{1+x}{1-x}$ is one-to-one, then find its inverse function. If possible, find the domains and ranges of f and its inverse.