Homework 1, MATH 110-003

Due date: Tuesday, Sep 27, 2016 (in class)

Hand in full solutions to the questions below. Make sure you justify all your work and include complete arguments and explanations. Your answers must be clear and neatly written, as well as legible (no tiny drawings or micro-handwriting please!). Your answers must be stapled, with your name and student number at the top of each page.

1. Find the domain of the following functions, and write it in an interval notation.

(a) $f(x) = \dfrac{x+2}{x^2-9}$, (b) $g(x) = x^7 + x^2 - 1$,

(c) $h(t) = \dfrac{\sqrt{2t-1}}{t^3+1}$, (d) $f(t) = \dfrac{t^4+1}{\sqrt{t(t-1)}}$

2. Suppose $u(x) = \sqrt{2x+3}$, and $f(x) = |x^2 - 1|$

(a) Find $f \circ u(0)$, $f \circ u(-1)$, $u \circ f(-\frac{1}{2})$, $u \circ f(0)$.

(b) Find an equation for the slope of the line that passes through $(3, u(3))$ and $(3+h, u(3+h))$. (slope will be a function of h).

(c) Find the equation for $f \circ u(x)$.

(d) *(Bonus)* Find the domain and range of $f \circ u$, and sketch the graph of $f \circ u$.

3. (a) Function f crosses the x-axis at 5. What is the y-intercept of f^{-1}?

(b) Assuming part (a), suppose f is a quadratic function with vertex $(3, -1)$. Restrict the domain of f such that it becomes invertible. What is the domain and range of f and f^{-1}?

(c) Sketch the graph of f and f^{-1}.

4. (a) Find the two points at which the parabolas

$$y = (x-1)^2 + 1, \qquad y = -2x^2 + 3$$

intersect, and call them P and Q.

(b) Find the equation of the line that passes through P and Q.

(c) Sketch the parabolas and the line.