MCS 118 EXAM 1 Oct 9, 2020

All of your answers must be carefully justified. Neat work, clear and to-the-point explanations will receive more credit than messy, chaotic answers. You may refer to any result proved in class unless otherwise specified. You may use results you proved on your homework, except for ones the problem specifically asks you to prove.

You are not allowed to use your textbook or your class notes, but you may use a simple calculator.

- 1. (10 pts) Express the surface area of a cube as a function of its volume.
- 2. (10 pts) Find an expression for the quadratic polynomial function whose graph is shown.



3. (a) (4 pts) Let S and T be nonempty sets. State the definition of a function $f: S \to T$. (b) (3 pts)



The crowd gathers at Moe's Tavern on a Friday night. Let S be the set of all people in the bar and let T be the set of all bottles in the bar containing beverages. Construct a rule $f: S \to T$ that is a function and carefully explain why f is a function.

- (c) (3 pts) Using the same sets S and T, construct a rule $g: S \to T$ that is not a function and carefully explain why g is not a function.
- 4. (10 pts) Find the largest possible subset of the real numbers that could be the domain of the function

$$f(x) = \sqrt[4]{5 - \frac{2}{x}}.$$

- 5. (5 pts each) Extra credit problem.
 - (a) Let f and g be functions $\mathbb{R} \to \mathbb{R}$. If f is an even function and fg is an odd function, is g an odd function?
 - (b) Let \mathbb{R}^* denote the set of all nonzero real numbers and let f and g be functions $\mathbb{R} \to \mathbb{R}^*$. If f is an even function and fg is an odd function, is g an odd function?