ASU ID:

Name:

**CPI 200** October 5, 2009

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**Mock Final**

Let $\mathbb{R}, \mathbb{Q}, \mathbb{N}$ define the reals, rationals, and natural numbers resp.

1. Is $\mathbb{Q} \subset \mathbb{R} \cap \mathbb{N}$? Explain.

2. Order these sets by their cardinality, indicating if any are of the same cardinality.

4. Give the truth table for the logical expression

$$p \rightarrow (p \wedge q)$$

5. Which set is defined by the the following recursion:

$$p(n) = \begin{cases} 1 & \text{if } \ n = 1, \\ p(n-1) + n & \text{else.} \end{cases}$$

It will be sufficient if you give the 5 first elements.

6. In order to show that the two sets $[0, 1]$ and $[0, 2]$ have the same cardinality, one constructs a bijection between them. What is that bijection?

7. Find

$$\lim_{n \rightarrow \infty} \frac{3n^3 + 1}{6n^3 - 1}$$

and explain your answer.

8. Is the function

$$y = \frac{1}{x^2}$$

even, odd, or neither? Explain.

9. As $x \rightarrow \infty$, what function does

$$y = \frac{\sin(x)}{3x^3 - 1}$$

approach? Explain.

10. Give an example of a discontinuous function. Explain why it is discontinuous.