

ASSIGNMENT 3

MATH 303, FALL 2011

Instructions: *Do at least 3 points from each section and at least 10 points total. Up to 12 points will be graded, but your maximum score is 10. If you hand in more than 12 points please indicate which ones you want graded, otherwise the first 12 will be graded.*

MANIPULATION

- (M1) **(1 point)** Write the number 3 as a set using the following notation:
 - (a) use 0, 1, and 2.
 - (b) use only \emptyset and curly brackets.
- (M2) **(1 point)** What is $\{0, 3, 4\}^+$?
- (M3) **(1 point)** Let $X = \{a, b\}$, $Y = \{c, d, e\}$, write down Y^X
- (M4) **(1 point)** Let $X = \{a, b\}$, $Y = \{c, d, e\}$, write down X^Y
- (M5) **(1 point)** Explain why the set $\{(a, c), (1, c), (b, 2), (2, 3), (a, 4)\}$ is not a function.
- (M6) **(1 point)** Show that $\{a, b, c\}$ is equivalent to 3.

PURE MATH

- (P1) **(4 points)**
 - (a) What is $\bigcup 4$ (viewing 4 as a set, as always)
 - (b) Use the principle of mathematical induction (in the set theoretic formulation) to show that if $\bigcup(n+1) = n$ for all $n \in \omega$. *This is not the only way to show this result, but I want people to practice induction in this context.*
- (P2) **(3 points)** Show that ω and ω^+ are equivalent; be sure to show the justification that your function is one-to-one and onto. *This is telling you that $\infty = \infty + 1$.*

IDEAS

- (I1) **(2-5 points)** Is the unexpected examination paradox still paradoxical if there is only one day? Discuss. *There is a lot of scope to make this problem either small or large, hence the point range.*
- (I2) **(5 points)** Write a micro-essay (length: 1 page) describing the roles of Fraenkel and Skolem in extending Zermelo's axioms to the modern axioms for set theory. Cite sources at least one of which is not Wikipedia.