

Math 220 – Homework 1

Due Thursday 9/6 at the beginning of class

Total points: 173 (Problems marked by * will count toward writing portion.)

PART A

- 21 points Determine whether each of the following sentences is a proposition, predicate, or neither.
 - Give me a call.
 - The train is leaving in 30 minutes.
 - Excessive exposure to the sun may cause skin cancer.
 - $13^{12} > 12^{13}$.
 - $x^2 \neq -1$.
 - For every real number r , $r^4 \neq -1$.
 - If p and q are rational numbers, then $p - q$ is rational.

- 20 points State the negation for each of the following propositions.
 - The perimeter of the square is at most 2018 inches.
 - Two sides of an isosceles triangle have the same length.
 - The point M on the plane lies outside of the polygon Π .
 - The number $\sqrt{2018}$ is rational.
 - The number 0 is negative.

- 32 points Consider the following propositions

$$P : 2018 \in 3\mathbb{Z} \quad \text{and} \quad Q : 3^{2018} \in \mathbb{O}.$$

Write each of the following compound statements in words and indicate whether it is true or false.

(a) P ; (b) Q ; (c) $\neg P$; (d) $P \vee Q$; (e) $P \wedge Q$; (f) $P \Rightarrow Q$; (g) $\neg Q \Rightarrow P$; (e) $P \Leftrightarrow Q$.

- 10 points For the predicate $P(x) : (x^3 + 1)(x^2 - 2) = 0$, where $x \in \mathcal{U}$, determine:
 - the values of x for which $P(x)$ is a true statement if $\mathcal{U} = \mathbb{R}$.
 - the values of x for which $P(x)$ is a false statement if $\mathcal{U} = \mathbb{N}$.
- * 10 points The professor tells to Amy: “If you get at least B on the final exam, then you will pass the course”. Amy passes the course. What can she conclude?
 - She got at least B on the final exam.
 - She cannot conclude anything.

Give reasons for your answer.

- * 10 points The professor tells to Amy: “If you get at least B on the final exam, then you will pass the course”. Amy finds out that she got a C on the final. What can she conclude?
 - She'd better start looking for a summer school course.
 - There's still hope.

Give reasons for your answer.

NAME (print) _____

Section (circle) 902 905

70 points PART B*

Rewrite each sentence according to provided guidelines (see “Communicating Mathematics” on eCampus), then using complete sentences give a reason to changes you made.

1. In mathematics, an irrational number r is a real number that cannot be expressed as a ratio of integers, e.g. as a fraction.
2. Let a, b, c, M , and N be given integers.
3. $m^4 + m^2 + 2018$ is positive for every real m .
4. Pure mathematics topics often turn out to have applications, i.e. number theory in cryptography.
5. If x, y are integers of the same parity, then $x + y$ is even.
6. The square of every integer n is even.
7. f is differentiable everywhere.
8. Every number $\in \mathbb{E}$ is divisible by 2.