

# Homework 3 Rubric, Math 287

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Im trying something new here. I'm going to put remarks on the various questions here, particularly of kinds which occur on more than one paper. Your paper might contain pointers to items in this document.

The document will not necessarily contain worked answers to each question, but it might contain worked answers to some if adequate comments require this.

**2.3.2:** it's really 2.3.1 of course. If enough people miss it because of the typo, Ill make some grading provision.

1. I gave 3 points if you imposed the additional constraint which is not in the problem that the answer be positive. The answer is  $-44$ .

**2.3.5:**

1. 2 points for just stating the gcd. I want to hear the story of how it is the smallest element of a certain set.
2. Full credit involves showing that the desired element is in the set; ideally Id like to see some argument that no positive number less than that element is in the set (divisibility can be used to argue for that). 4 pts if nothing is said about why it is smallest. Full credit for some effort at that.

**2.3.6:**

1.  $\gcd(0, n)$  is actually  $|n|$ , as  $n$  might be negative. Remarking, but not taking points off for  $n$ , as we are usually thinking only of positive integers.
2. The set in the definition of the gcd is a set of positive integers, 0 not included.

**3.1:** Easiest to state solutions. These are not necessarily the only possible ways to say these things.

1.  $(\exists m \in \mathbb{N} : (\forall n \in \mathbb{N} : m \leq n))$
2.  $\neg(\exists m \in \mathbb{Z} : (\forall n \in \mathbb{Z} : m \leq n))$
3.  $(\forall x \in \mathbb{Z} : (\exists y, z \in \mathbb{Z} : x = yz))$
4.  $(\exists x, y \in \mathbb{Z} : x^2 - 2y^2 = 3)$

**3.2:** A brief indication of the correct approach to each.

1. True. For each  $x$  a suitable  $y = 1 - x$ .
2. False. There is no fixed  $y$  such that adding any  $x$  at all to it will give 1.
3. True. For each  $x$ , there is at least  $y = 1$  such that  $xy = x$  (if  $x = 0$  any  $y$  at all will work).
4. True.  $y = 1$  works, identity property of multiplication.

**first sentence negation:** There were enough people who did very badly on both negations that I made them parts of one problem in terms of how marks were computed.

1. Negate If I wake up tomorrow I will eat toast and I will eat eggs:  
Use  $\neg(P \rightarrow Q) \equiv P \wedge \neg Q$  and  $\neg(P \wedge Q) \equiv \neg P \vee \neg Q$  to get  
I will wake up tomorrow and either I will not eat toast or I will not eat eggs.

**second sentence negation:** 1. Negate Either I don't love you or roses are red and violets are blue  
Use  $\neg(P \vee Q) \equiv \neg P \wedge \neg Q$  and  $\neg(P \wedge Q) \equiv \neg P \vee \neg Q$  and double negation to get  
I love you and either roses are not red or violets are not blue.