Math 3283W - Sample Writing Quiz

15 minutes **Name:** Sample

Remember that your work is graded on the quality of your writing and explanation as well as the validity of the mathematics.

(1) (6 Points) Prove: the square of an odd integer is odd.

Let n be an odd integer, so $n = 2k+1$ for some integer k. Then

$$\begin{aligned} n^2 &= (2k+1)^2 \\ &= 4k^2 + 4k + 1 \\ &= 2(2k^2 + 2k) + 1, \end{aligned}$$

which has the form of an odd integer. Hence n^2 is odd.

Math 15/15 **Overall:** 20/20

Writing 5/5

(2) (9 Points) Recall the following definition: x is a *rational* number if and only if it can be written in the form $x = \frac{a}{b}$, where a and b are integers and $b \neq 0$. Prove: the sum of two rational numbers is rational.

Let x and y be rational, so $x = \frac{a}{b}$ and $y = \frac{c}{d}$ for integers a, b, c and d with $b \neq 0$ and $d \neq 0$. Then

$$\begin{aligned} x + y &= \frac{a}{b} + \frac{c}{d} \\ &= \frac{ad+bc}{bd} \end{aligned}$$

Note that $ad+bc$ and bd are both integers, and $bd \neq 0$ because both b and d are nonzero. Thus $x+y$ is rational.

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(1) (6 Points) Prove: the square of an odd integer is odd.

$$n^2 = (2k+1)^2 = 4k^2 + 4k + 1 = 2(2k^2+2k)+1,$$

Overall, the math in both parts is mostly correct (what's k?) for 14/15

The writing score would be 0/5, or at most 1/5.

No explanation at all in (1), not even of why n=2k+1. Similar issues in (2), plus an excessive amount of unneeded work.

(2) (9 Points) Recall the following definition: x is a *rational* number if and only if it can be written in the form $x = \frac{a}{b}$, where a and b are integers and $b \neq 0$. Prove: the sum of two rational numbers is rational.

Overall: 15/20

$$\frac{a}{b} + \frac{c}{d} = \frac{a}{b}\cdot\frac{bd}{bd} + \frac{c}{d}\cdot\frac{bd}{bd}$$

$$= \frac{abd}{b^2d}\cdot\frac{d}{d} + \frac{bcd}{bd^2}\cdot\frac{b}{b}$$

$$= \frac{abd^2}{b^2d^2} + \frac{b^2cd}{b^2d^2}$$

$$= \frac{abd^2+b^2cd}{b^2d^2}$$

$$= \frac{abd^2+b^2d^2-b^2d^2+b^2cd}{b^2d^2}$$

$$= \frac{d^2b(a+b)-b^2d(d+c)}{b^2d^2}$$

$$= \frac{d(a+b)-b(d+c)}{bd}$$

Now let $z=d(a+b)-b(d+c)$ and $w=bd$. Note $w\neq 0$ because $b,d\neq 0$. Then z/w is rational!

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(1) (6 Points) Prove: the square of an odd integer is odd.

Let n be an odd integer, so $n=2k+1$ for some integer k. Then

$$n^2 = (2k+1)^2$$
$$= 4k^2+2k+2$$
$$= 2(2k^2+k+1),$$

← major math error, but the writing is well organized and consistent.

3/6 for math

which is even, hence the problem is wrong.

(2) (9 Points) Recall the following definition: x is a *rational* number if and only if it can be written in the form $x = \frac{a}{b}$, where a and b are integers and $b \neq 0$. Prove: the sum of two rational numbers is rational.

Let $x = a/b$, where $a, b \in \mathbb{Z}$ and $b \neq 0$ and $y = c/d$ where $c, d \in \mathbb{Z}$ and $d = 0$ and then add them together: $x + y = \frac{a}{b} + \frac{c}{d} = \frac{a+c}{b+d}$ which is clearly in the form n/m where $n = a+c$ and $m = b+d$ and these are both integers, so the sum of two rational numbers is rational.

Major math error in addition, and didn't check that $b+d \neq 0$. 4/9 would be reasonable.

The writing is ok in (1) but an issue in (2). It's on long runon sentence, and one large block of text, which makes it difficult to read. Some justification is also lacking.

Overall Sore: 10/20

Averaging a 5/5 on (1) and 2/5 on (2) would give 3.5/5 overall for writing, probably rounded down because of extra weight of (2).

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Remember that your work is graded on the quality of your writing and explanation as well as the validity of the mathematics.

(1) (6 Points) Prove: the square of an odd integer is odd.

$1^2 = 1$ ✓ odd odd

$5^2 = 25$ ✓ odd odd

$9^2 = 81$ odd odd

$3^2 = 9$ ✓ odd odd

$7^2 = 49$ ✓ odd ~~even~~ odd

$11^2 =$ odd

Math: at most 1/6. The work is relevant to problem stmt, but checking examples won't lead to a proof.

(2) (9 Points) Recall the following definition: x is a *rational* number if and only if it can be written in the form $x = \frac{a}{b}$, where a and b are integers and $b \neq 0$. Prove: the sum of two rational numbers is rational.

Let x and y be rational numbers. Then $x = a/b$, $y = c/d$ where a, b, c, d are integers and $b \neq 0 \neq d$.

Then $x + y = \frac{a}{b} + \frac{c}{d}$.

Because the sum of two fractions is a fraction, $x+y$ must equal f/g for two integers f and g with $g \neq 0$.

So $x+y$ is rational.

math: at most 2/9. Definitions are used, but no progress made towards a proof

Overall: 4/20

writing: no points for (1) – there's no writing! In (2) there is writing, but it's not well organized and amounts to restating the problem. 1/5 overall