

MATH310 Homework 2022-07-15
Due Gradescope 11:59pm 2022-07-19

For each of the following a set of hypotheses are given and a conclusion is given. Use the hypotheses to prove the conclusion. The key item to focus on is clarity of your explanation.

1. Hypothesis 1: a is odd. [15 pts]
Hypothesis 2: b is odd.
Conclusion: $a - 7b$ is even.
2. Hypothesis 1: $x^2 - 4x = 0$ [15 pts]
Hypothesis 2: $x \neq 0$.
Conclusion: $x = 4$.
3. Hypothesis 1: a divides b . [15 pts]
Hypothesis 2: a divides $b + c$.
Conclusion: a divides $3c$.
4. Hypothesis 1: Q [15 pts]
Hypothesis 2: $\sim P \longrightarrow \sim Q$
Hypothesis 3: $P \rightarrow (R \vee S)$
Hypothesis 4: $\sim R$
Conclusion: S
5. Hypothesis 1: $x^2 - 2x > 0$ [15 pts]
Hypothesis 2: $x > 1$
Conclusion: $x > 2$
6. Hypothesis 1: a is an integer. [15 pts]
Conclusion: $2a^2 + a + 1$ is not divisible by 3.
Hint: Use three cases.
7. Here is a proof that $1 = 0$. What's wrong with it? [10 pts]
Let $x = 1$. Then $x - 1 = x^2 - 1$ (because both sides are 0). Then $x - 1 = (x + 1)(x - 1)$ and we divide both sides by $x - 1$ to get $1 = x + 1$. Since $x = 1$ we then have $1 = 1 + 1$ or $1 = 2$.