DEPARTMENT OF MATHEMATICS & STATISTICS

MT 251P

Homework 1

Due by 4 p.m. on October 21, 2022

1. State whether or not the following statements are true or false. Justify your answers.

(a) $\sqrt[3]{2}$ is irrational.

(b) $\dfrac{x}{y}$ is irrational for all irrational numbers x, y with $x \neq y$.

(c) There exist rational numbers m, t, w such that $m - 2w + t\sqrt{2} = 0$

2. Prove that $\sqrt{5}$ is irrational.

3. Prove that $\neg(\neg P \vee Q) \vee (P \wedge Q) \sim P$.

4. Is $(\neg P \wedge Q) \Rightarrow (Q \vee \neg P)$ a tautology? Justify your answer.

5. Are there integers x, y such that $9y - x^2 + 3 = 0$? Justify your answer.