

Homework 1 (Calculus)Solutions

1. (a) False, since no negative number is natural.
 (b) True, since every integer is rational
 (c) False: $\sqrt{2}$ is not even rational
 (d) True, since any rational number is real
 (e) False: π is not even rational
 (f) True, since every integer is a real number
 (g) False, since - for example - $\frac{1}{2} \in \mathbb{Q}$ but $\frac{1}{2} \notin \mathbb{N}$
2. (a) False, since 57 is smaller than 82
 (b) True: Any negative number is less than any positive number
 (c) False: $5^7 > 78,000$ while $7^5 < 17,000$
 (d) False: -80 is to the left of -78 on the real line.
 (e) True, since 4.7301 is less than 4.7302
 (f) True, since the numbers are equal
 (g) False, since a positive number is always greater than a negative
 (h) True, see (b).
3. (a) $F(\text{Helen}) = \text{Michael}$ (b) $M^*(\text{Michael}) = \text{Aoife}$.
 (c) $F(M(\text{Helen})) = F(\text{Fiona}) = \text{Tomás}$. (d) $M(F(\text{Helen})) = M(\text{Michael}) = \text{Aoife}$.
4. (a) $\mathbb{R} \setminus \{2\}$ (e) All numbers ≤ 1 $(-\infty, 1]$
 (b) All numbers ≥ 0 $([0, \infty))$ (f) All numbers ≤ 2 $(-\infty, 2]$
 (c) All numbers ≥ 1 $([1, \infty))$ (g) Solve $5 - 2x > 0$:
 $5 > 2x$:
 $\frac{5}{2} > x$
 (d) All numbers ≥ -1 $([-1, \infty))$ Solⁿ: All numbers $< \frac{5}{2}$ $(-\infty, \frac{5}{2})$
- (h) Solve $4x - 7 \geq 0$: All numbers $\geq 7/4$ $([7/4, \infty))$.