

### Numerical Analysis MATH50003 (2023–24) Problem Sheet 3

**Problem 2** With 8-bit unsigned integers, what is the result for the following computations:

$$127 \oplus_{256} 200, \quad 2 \otimes_{256} 127, \quad 2 \otimes_{256} 128, \quad 0 \ominus_{256} 1$$

**Problem 2(a)** With 8-bit signed integers, what are the bits for the following: 10, 120,  $-10$ .

**Problem 2(b)** With 8-bit signed integers, what is the result for the following computations:

$$127 \oplus_{256}^s 200, \quad 2 \otimes_{256}^s 127, \quad 2 \otimes_{256}^s 128, \quad 0 \ominus_{256}^s 1$$

**Problem 3** What is  $\pi$  to 5 binary places? Hint: recall that  $\pi \approx 3.14$ .

**Problem 4** What are the single precision  $F_{32} = F_{127,8,23}$  floating point representations for the following:

$$2, \quad 31, \quad 32, \quad 23/4, \quad (23/4) \times 2^{100}$$

**Problem 5** Let  $m(y) = \min\{x \in F_{32} : x > y\}$  be the smallest single precision number greater than  $y$ . What is  $m(2) - 2$  and  $m(1024) - 1024$ ?