Math 248 - HW 5

19. $\pm b_0.b_1b_2 \times 10^k$

$b_i \in \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

$k \in \{-9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

Largest Positive Number: $9.99 \times 10^{10} = 99{,}900{,}000{,}000$

Smallest Positive Number: $0.01 \times 10^{-9} = 0.000000000001$

π: $3.14 \times 10^0 = 3.14$

20. $x = 13_{10}$

$13_{10} \rightarrow 1101_2 = 1.\underbrace{101}_{\text{mantissa}} \times 2^{3 \leftarrow \text{exponent} = 011_2}$

Sign exponent mantissa $= \boxed{0011101_2}$

21. Precision $\approx \log_{10}(2^n)$ where n is the number of bits in the mantissa

$\log_{10}(2^{53}) = 53 \times \log_{10}(2) = 15.9545897702$

IEEE doubles are accurate up to 15 decimal places.