Homework 02

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Question 1-3 are to be submitted on paper once per group at the beginning of class. Submit `hw02q4.m` on canvas.

1. (a) Convert the binary number 110100.0101 to a decimal number. Show your work!
   (b) Convert the decimal number -78.3125 to binary and then also write it in standard binary form. What is the 64-bit floating point representation of -78.3125? Give sign, mantissa, and exponent separately!

2. Convert the decimal number 0.2 to binary. Argue that it has an infinite number of digits in binary representation. How can that explain that "0.3-0.2-0.1" does not return 0 in Matlab (what does Matlab return?).

3. What is next biggest computer representable number after 1 (assuming 64 double floating point numbers)? What about after 78.3125?

4. Write a MATLAB function `tobinary(n)` that, given a whole number n, outputs its base 2 representation. The output should be a vector with 0s and 1s. Example:

```
>> tobinary(34)
ans =
    1  0  0  0  1  0
```

   Hint: For finding the power p of 2 in the algorithm it helps to know that you can just check the values $p = p_{max}$, $p_{max} - 1$, ..., 0 where p_{max} is the logarithm in base 2 rounded down: `pmax=floor(log2(n))`. Then either add a zero or a one to the output vector for each p. Note that you only need to do a single call to `log2`.

Bonus: take a look at `https://www.youtube.com/watch?v=PZRI1IfStY0` and `http://minecraft.gamepedia.com/Far_Lands` (esp. 1.3.1).