1. Suppose we have a computer that uses (single-precision) IEEE Standard floating point arithmetic: 24 digits to represent the mantissa, and exponents in the range $[-126, 127]$.

(a) (5) Consider evaluating the expression $c = a \times b$ on this machine. Give a machine-representable (finite) value for $a$ and a machine-representable (finite) value for $b$ for which the computed value $c=\text{INF}$ because of overflow.

(b) (5) What is the distance between $2^{20}$ and the next larger floating point number?
2. (5) Consider the following MATLAB code fragment:

```matlab
x = 1;
delta = 1 / 2^(53);
for j1=1:2^(20),
    x = x + delta;
end
```

Using mathematical reasoning, we expect the final value of `x` to be $1 + 2^{-33}$. Use your knowledge of double-precision floating-point arithmetic (53 bit mantissa, with exponents in the range $[-1022, 1023]$) to predict what it will actually be. Briefly explain your prediction.

3. (5) If we type `cos(pi/2)` in MATLAB, the computed answer is $6.1232e-17$. Why doesn’t MATLAB return the correct value, 0?