Math/CS 466/666 **Homework Assignment 01**

Floating Point Arithmetic

1. Evaluate the following expressions using 3-significant-digit base-10 floating point arithmetic. Round to the nearest floating point number and on a tie choose the mantissa whose least significant digit is even.

(i) $(3.14159)^*$

(ii) $6.19 \times 10^2 +^* 3.61 \times 10^1$

(iii) $1.23 \times 10^3 * 9.54 \times 10^{-5}$

(iv) $3.52 \times 10^3 +^* 5.43 \times 10^0$

(v) $(2.71459)^* +^* (-2.72687)^*$

2. A hypothetical computer carries out calculations using 3-significant-digit base-10 floating point arithmetic. The rounding mode is round to the nearest floating point number and on a tie choose the mantissa whose least significant digit is even.

(i) Suppose the program

```
input x
input y
print x
print y
print x+y
```

is executed and the output is

```
5.14
6.71
11.8
```

Find bounds on the absolute errors e_x, e_y, e_{prop}, e_{gen} and e_{tot}.

(ii) Suppose the program

```
input x
input y
print x
print y
print x*y
```

is executed and the output is

```
5.14
6.71
34.5
```

Find bounds on the relative errors $\tilde{e}_x$, $\tilde{e}_y$, $\tilde{e}_{\text{prop}}$, $\tilde{e}_{\text{gen}}$ and $\tilde{e}_{\text{tot}}$.