Homework Assignment #1

Numeric Analysis (Fall 5778)

Question 1

Write a function that will convert between the following bases (there is no need to worry about fractions):

- Decimal (10) to binary (2)
- Binary (2) to decimal (10)
- Decimal (10) to Hexadecimal (16)

input.txt

`dec to bin: 341`
`bin to dec: 110110`
`dec to hex: 4389`

output.txt

`0b101010101`
 	
`54`
 	
`0x1125`

Note: the output must include leading '0b' for binary and '0x' for hexadecimal.

Question 2

Express a number as it floating point expressions as either a **double** or a **float**. You must separate between the **sign**, **exponent**, and the **mantissa**.

input.txt
`to float: -248.75` `to double: 12.34`
output.txt

```
s: 1
e: 10000110
m: 11110001100000000000000

s: 0
e: 10000000010
m: 10001010111000010100011110101110000101000111101011 0
```

Question 3

Calculate the **relative** and **absolute** errors (up to 6 decimal places) for the following examples:

- $x = sin(0.5)$, $x_0 = 0.4794$
- $x = e$, $x_0 = \Sigma\ 1/k!\ (from\ k = 0\ to\ k = 20)$
- $x = \pi$, $x_0 = 4\Sigma\ ((-1)\text{^}k+1)\ /\ (2k - 1)\ (from\ k = 1\ to\ k = 20)$

Note: You are expected to print out the results of your calculations without taking into account any input. The results should come after the results of the previous questions and should be presented as they are below.

Complete input/output example

input.txt

```
dec to bin: 341
bin to dec: 110110
dec to hex: 4389
to float: -248.75
to double: 12.34
```

output.txt

```
0b101010101

54

0×1125

s: 1
e: 10000110
m: 11110001100000000000000

s: 0
e: 10000000010
m: 10001010111000010100011110101110000101000111101011 0

absolute delta: *** ***
relative delta: *** ***

absolute delta: *** ***
relative delta: *** ***

absolute delta: *** ***
relative delta: *** ***
```