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1/28/20
Phys 510
Homework #1

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a)

-1/3 ≈ -0.33333334 = 10111110101010101010101010101011

b)

$$x_1 = 0.11258762 \times 10^2 \quad \& \quad x_2 = 0.11244891 \times 10^2 \tag{1}$$
$$x_1 + x_2 = (0.11258762 \times 10^2) + (0.11244891 \times 10^2) \tag{2}$$
$$= (0.11258762 + 0.11244891) \times 10^2 \tag{3}$$
$$= (0.22503653) \times 10^2 \tag{4}$$
$$= 22.50 \tag{5}$$

relative error = $(22.503653 - 22.50)/22.503653 = 0.0162\%$

$$x_1 - x_2 = (0.11258762 \times 10^2) + (0.11244891 \times 10^2) \tag{6}$$
$$= (0.11258762 - 0.11244891) \times 10^2 \tag{7}$$
$$= (0.00013871000000000022) \times 10^2 \tag{8}$$
$$= (0.0001 \times 10^2) = 0.01 \tag{9}$$

relative error = $(0.0139 - 0.01)/0.0139 = 28.06\%$

$$\tag{10}$$

c)

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d)

$$\exp(x) = \sum_{k=0}^{\infty} \frac{x^k}{k!} \tag{11}$$

For single precision we have $e^1 = 2.7182817$ and for double precision we have $e^1 = 2.718281828459045$

For k summed up to 10 and beyond we have $e^1 = 2.7182817$

For k summed up to 17 and beyond we have $e^1 = 2.718281828459045$

$$\tag{12}$$

e)

Machine epsilon for single precision $2^{-23} = 1.1920929 \times 10^{-7}$
Machine epsilon for double precision $2^{-52} = 2.220446049250313 \times 10^{-16}$

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