Assignment 1 of CISC 2002

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114_{10}

$$\left.\begin{array}{r|l} 2\underline{)114} & 0 \\ 2\underline{)57} & 1 \\ 2\underline{)28} & 0 \\ 2\underline{)14} & 0 \\ 2\underline{)7} & 1 \\ 2\underline{)3} & 1 \\ 2\underline{)1} & 1 \end{array}\right\} 1110010$$

$$\begin{aligned} 0.25 \times 2 &= 0.5|0 \\ 0.5 \times 2 &= 1|1 \end{aligned}$$

$$0.25_{10} = 0.01_2$$

$$\begin{aligned} -114.25 =& -1110010.01 \\ =& -1.11001001 \times 2^6 \\ =& (-1)^1 \times 2^6 \times 1.11001001 \\ s =& 1 \\ e - 127 =& 6 \\ e =& 133 \\ f =& 11001001 \end{aligned}$$

133_{10}

$$\left.\begin{array}{r|l} 2\underline{)133} & 1 \\ 2\underline{)66} & 0 \\ 2\underline{)33} & 1 \\ 2\underline{)16} & 0 \\ 2\underline{)8} & 0 \\ 2\underline{)4} & 0 \\ 2\underline{)2} & 0 \\ 2\underline{)1} & 1 \end{array}\right\} 10000101$$

The representation of -114.25 in IEEE single precision formatis is

$$1100\ 0010\ 1110\ 0100\ 0000\ 0000\ 0000\ 0000$$

2

$$0100\ 0011\ 0101\ 0100\ 0000\ 0000\ 0000\ 0000$$

$$\begin{aligned} s =& 0 \\ e =& 10000110_2 \\ =& 134 \\ f =& 10101 \\ (-1)^s \times 2^{e-127} \times 1.10101 =& 2^7 \times 1.10101 \\ =& 11010100_2 \\ =& 212 \end{aligned}$$

3

3.1

$$\begin{aligned} \frac{1}{5} \times 2 &= 0.4|0 \\ 0.4 \times 2 &= 0.8|0 \\ 0.8 \times 2 &= 1.6|1 \\ 0.6 \times 2 &= 1.2|1 \\ 0.2 \times 2 &= 0.4|0 \\ &... \\ &... \\ &... \\ \frac{1}{5}_{10} &= 0.\dot{0}01\dot{1}_2 \end{aligned}$$

3.2

$$\begin{aligned} -9.6 = (-1)^1 \times 2^3 \times 1.2 \\ s =& 1 \\ e - 127 =& 3 \\ e = 130_{10} = 10000010_2 \\ 1.f =& 1.\dot{0}01\dot{1}_2 \end{aligned}$$

The representation of -9.6 in IEEE single precision formatis is

$$1100\ 0001\ 0001\ 1001\ 1001\ 1001\ 1001\ 1001$$

3.3

1100 0001	0001 1001	1001 1001	1001 1001
C 1	1 9	9 9	9 9

4

4.1

By L'Hospital's rule,

$$\begin{aligned} \lim_{x\to 0} f(a) &= \lim_{x\to 0} \frac{\sqrt{2+x} - \sqrt{2-x}}{2x} \\ &= \lim_{x\to 0} \frac{\frac{1}{2}(\frac{1}{\sqrt{2+x}} + \frac{1}{\sqrt{2-x}})}{2} \\ &= \frac{\frac{1}{\sqrt{2}}}{2} \\ &= \frac{\sqrt{2}}{4} \end{aligned}$$

4.2

4.3

Proof.

$$\begin{aligned}
f(x) =& \frac{\sqrt{2+x}-\sqrt{2-x}}{2x} \\
=& \frac{(\sqrt{2+x}-\sqrt{2-x})(\sqrt{2+x}+\sqrt{2-x})}{2x(\sqrt{2+x}+\sqrt{2-x})} \\
=& \frac{2+x-(2-x)}{2x(\sqrt{2+x}+\sqrt{2-x})} \\
=& \frac{2x}{2x(\sqrt{2+x}+\sqrt{2-x})} \\
=& \frac{1}{\sqrt{2+x}+\sqrt{2-x}}
\end{aligned}$$

□

4.4

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a=-5:-1:-20
x=10.^a
y1=(sqrt(2+x)-sqrt(2-x))./(2.*x)
y2=1./(sqrt(2+x)+sqrt(2-x))
semilogx(x,y1,x,y2)
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Listing 1: Assignments1-4.4.m

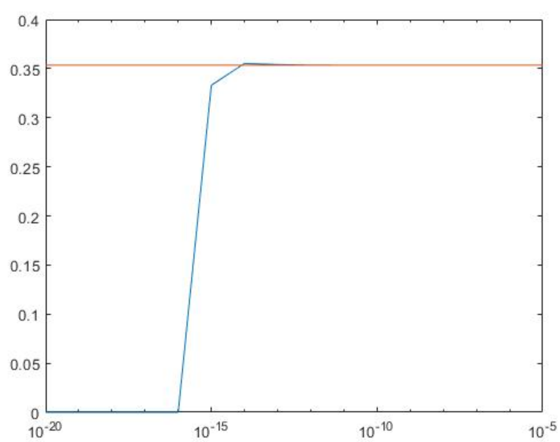

Figure 1: Output