MATH 103 Sochacki Turn In Assignment 4 Name Key West
Due June 4, 2015 50 Points

Work on the following problems. Your work must be written neatly on 8.5x11 inch paper with this sheet on the top of your write up or I will not grade your work. All necessary work must be shown for credit. Your work must represent the question asked. You may discuss this assignment with others, but all work turned in must be your own work. Your work is more important than the answer.

I have neither received nor given help on this project. Car Key
(Signature)

1. Give a polynomial for (a) $\frac{2+x}{1+x}$ (b) $1+\frac{1}{1+x}$.
2. You have 8 bits to store whole numbers. (a) How many different natural numbers can you store? (b) What is the largest number you can store? (c) What is the smallest number you can store? (d) How do you store the base ten number 123 in your 8 bits?
3. Convert the following numbers.
   (a) 147 to base two (b) $(A23B1)_{12}$ to base ten (c) $(101011.01)_2$ to base ten
   (d) $\left(1011.010\bar{1}\right)_2$ to base ten (e) $(1AB27.1B)_{12}$ to base ten
   (f) 0.35 to base two (g) $\frac{3}{7}$ to base twelve.
4. Give two methods for determining $\sqrt{17}$. Give the first 3 digits of $\sqrt{17}$ using these two methods.
5. Give three methods to calculate $\sqrt{29}$. Use one of these methods to give the first 3 digits of $\sqrt{29}$.

1 (a) $\frac{2+x}{1+x} \rightarrow$

$$
\begin{array}{r|l}
 & 2-x+x^2-x^3+x^4-x^5+x^6\cdots \\
\hline
1+x & 2+x \\
 & 2+2x \\
\hline
 & -x \\
 & -x-x^2 \\
\hline
 & x^2 \\
 & x^2+x^3 \\
\hline
 & -x^3
\end{array}
$$

(b) $1+\frac{1}{1+x}=\frac{1+x}{1+x}+\frac{1}{1+x}=\frac{2+x}{1+x}$

$1+\frac{1}{1+x}=1+1-x+x^2-x^3+\cdots$

$=2-x+x^2-x^3+\cdots$

2. $\underline{\ }\ \underline{\ }\ \underline{\ }\ \underline{\ }\ \underline{\ }\ \underline{\ }\ \underline{\ }\ \underline{\ }$

$2\ \ 2\ \ 2\ \ 2\ \ 2\ \ 2\ \ 2\ \ 2$

(a) 2^8 total choices, each choice a number 2^8-1 natural numbers

(b) largest $\frac{1}{2^7}\frac{1}{2^6}\frac{1}{2^5}\frac{1}{2^4}\frac{1}{2^3}\frac{1}{2^2}\frac{1}{2^1}\frac{1}{2^0}$

$= 2^7+2^6+2^5+2^4+2^3+2^2+2^1+2^0 = 2^8-1$

$= 255$

(c) smallest 0

(d) $2\overline{)123}$

$2\overline{)61}$ $a_0 = 1$

$2\overline{)30}$ $a_1 = 1$

$2\overline{)15}$ $a_2 = 0$

$2\overline{)7}$ $a_3 = 1$

$2\overline{)3}$ $a_4 = 1$

1 $a_5 = 1$

a_6

$-\frac{1}{2^6}\frac{1}{+2^5}\frac{1}{+2^4}\frac{1}{+2^3}\frac{0}{}\frac{1}{+2^1}\frac{1}{+2^0}$

3 (a) $2\overline{)147}$

$2\overline{)73}$ $a_0 = 1$

$2\overline{)36}$ $a_1 = 1$

$2\overline{)18}$ $a_2 = 0$

$2\overline{)9}$ $a_3 = 0$ $\qquad (10010011)_2$

$2\overline{)4}$ $a_4 = 1$

$2\overline{)2}$ $a_5 = 0$

1 $a_6 = 0$

a_7

(b) $(A23B1)_{12} = A \times 12^4 + 2 \times 12^3 + 3 \times 12^2 + B \times 12^1 + 1$

$= 10 \times 12^4 + 2 \times 12^3 + 3 \times 12^2 + 11 \times 12 + 1$

$= 211,381$

(c) $(101011.01) = 2^5 + 2^3 + 2^1 + 2^0 + 2^{-2}$

$= 43 + \frac{1}{4} = 43.25$

(d) $X = (1011.010\overline{1})_2$

$2X = (10110.10\overline{1})_2$

$2^2X = (101101.0\overline{1})_2$

$2^3X = (1011010.\overline{1})_2$

$= 2^6 + 2^4 + 2^3 + 2^1 + 1$

$= 91 \implies X = \frac{91}{8} = 11.375$

(e) $(1AB27.1B)_{12} = 12^4 + A \times 12^3 + B \times 12^2 + 2 \times 12 + 7 + 12^{-1} + B \times 12^{-2}$

$= 12^4 + 10 \times 12^3 + 11 \times 12^2 + 2 \times 12 + 7 + \frac{1}{12} + \frac{11}{12^2}$

$= 39,631 + \frac{23}{144}$

(f) 0.35

$0.7 \quad a_{-1} = 0$

$1.4 \quad a_{-2} = 1$

$0.8 \quad a_{-3} = 0$

$1.6 \quad a_{-4} = 1$

$1.2 \quad a_{-5} = 1$

$0.4 \quad a_{-6} = D$

$0.8 \quad a_{-7} = 0$

$(.0101\overline{10})_2$

(g) $\frac{3}{7}$

$$
\begin{array}{r}
.428571 \\
7 \overline{)\,3.000000} \\
28 \\
\hline
20 \\
14 \\
\hline
60 \\
56 \\
\hline
40 \\
35 \\
\hline
50 \\
49 \\
\hline
10 \\
7 \\
\hline
3
\end{array}
$$

$\frac{3}{7} = .\overline{428571}$

$\times 12$

$(0.5186A\ldots)_{12}$

4 $$1 + \cfrac{4}{1+\cfrac{4}{1+\cfrac{4}{1}}} = f = \frac{1+\sqrt{17}}{2}$$

$$1 + \sqrt{17} = 2(f)$$

$$\sqrt{17} = 2f - 1$$

$$x = \sqrt{17}$$

$$x^2 = 17$$

$$x^2 + x = 17 + x$$

$$x(x+1) = 17 + x$$

$$x = \frac{17+x}{1+x}$$

5. $$1+\cfrac{7}{1+\cfrac{7}{1+\cfrac{7}{1}}} = f = \frac{1+\sqrt{29}}{2}$$

$$\sqrt{29} = 2f - 1$$

$$5+\cfrac{1}{5+\cfrac{1}{5+\cfrac{1}{5}}} = F = \frac{5+\sqrt{29}}{2}$$

$$\sqrt{29} = 2F - 5$$

$$X = \sqrt{29}$$

$$X^2 = 29$$

$$X^2 + X = 29 + X$$

$$X(X+1) = 29 + X$$

$$X = \frac{29+X}{1+X}$$