

## Math 116

### Solutions to Assignment 1

30)

*Convert 32 to a binary number*

$$32 = 2^5$$

$$\Rightarrow 32 = 1 \cdot 2^5 + 0 \cdot 2^4 + 0 \cdot 2^3 + 0 \cdot 2^2 + 0 \cdot 2^1 + 0 \cdot 2^0$$

$$\Rightarrow 100000_2$$

31)

Convert 222 to a binary number

*First Check all power of 2 that divide 243*

$$2^0 = 2$$

$$2^1 = 2$$

$$2^2 = 4$$

$$2^3 = 8$$

$$2^4 = 16$$

$$2^5 = 32$$

$$2^6 = 64$$

$$2^7 = 128$$

$$2^8 = 256$$

*Write 222 as a difference (Note :  $222 - 128 = 94$ )*

*Thus,  $243 = 128 + 94$*

*Then,  $243 = 2^7 + 94$*

*Find the greatest power of two that divides 94 which is  $2^6 = 64$*

*So,  $243 = 2^7 + 64 + 30$*

$$\Rightarrow 243 = 2^7 + 2^6 + 16 + 14$$

$$\Rightarrow 243 = 2^7 + 2^6 + 2^4 + 14$$

$$\Rightarrow 243 = 2^7 + 2^6 + 2^4 + 8 + 6$$

$$\Rightarrow 243 = 2^7 + 2^6 + 2^4 + 2^3 + 4 + 2$$

$$\Rightarrow 243 = 2^7 + 2^6 + 2^5 + 2^4 + 2^2 + 2^1$$

$$\Rightarrow 243 = 1 \cdot 2^7 + 1 \cdot 2^6 + 0 \cdot 2^5 + 1 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0$$

$\Rightarrow$  *The binary number is  $11011110_2$*

32)

$$2222 = 2^{11} + 2^7 + 2^5 + 2^3 + 2^1$$

$$\Rightarrow 100010101110_2$$

1) Convert to base 10

$$111_2 = 1 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 = 4 + 2 + 1 = 7$$

2) Convert to base 10

$$1011001_2 = 1 \cdot 2^6 + 0 \cdot 2^5 + 1 \cdot 2^4 + 1 \cdot 2^3 + 0 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0 = 64 + 16 + 8 + 1 = 89$$

3) Convert to base 10

$$1011_2 = 1 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 = 8 + 2 + 1 = 11$$