1.3

From high-level languages, such as C code, the code first goes through a pre-processing phase to handle macros. Then it compiles and is preprocessed to be translated into assembly. When it is turned into assembly code, it is passed into an assembler which is then converted into machine language that reads the code as ones and zeros. Lastly the machine may use reference libraries in a process called linking, making the machine code a final executable product. The code is then finally executed and the operating system loads the executable into memory and the processor starts reading and executing the machine code instructions

1.4a)

Each pixel = 8 bits (red) + 8 bits (green) + 8 bits (blue) = 24 bits = 3 bytes

Total bytes = 1280 * 1024 * 3 = 3,932,160 bytes = **3.92 MB**

b) Total bits = 3,932,160 * 8 bits/byte = 31,457,280 bits

Time = Total bits/Network Speed = 31,457,280 bits / 100,000,000 bits/sec = **0.3145728 secs**

1.5a)
IPSp1 = clock rate / CPI = 3x10^9 / 1.5 = 2x10^9 instructions per second
IPSp2 = clock rate / CPI = 2.5x10^9 / 1 = 2.5x10^9 instructions per second
IPSp3 = clock rate / CPI = 4x10^9 / 2.2 = 1.81x10^9 instructions per second
P2 has the highest performance.
b) num cycles P1 = 3x10^9 x 10 = **30x10^9 cycles**
num instructions P1 = 30x10^9 / 1.5 = **20x10^9 instructions**
num cycles P2 = 2.5x10^9 x 10 = **25x10^9 cycles**
num instructions P2 = 25x10^9 / 1 = **25x10^9 instructions**
num cycles P3 = 4.0x10^9 x 10 = **40x10^9 cycles**
num instructions P3 40x10^9 / 2.2 = **18.18x10^9 instructions**
c) Exec time = num instructions / clock rate x CPI
clock rate = clock rate old x cpi old x 1.20 (20% incr) / 0.70 (30% decr)
clock rate P1 = 3x10^9 x 1.5 x 1.20 / 0.70 = **7.71 GHz clock rate**
clock rate P2 = 2.5x10^9 x 1 x 1.20 / 0.70 =**4.29 GHz clock rate**
clock rate P3 = 4.0x10^9 x 2.2 x 1.20 / 0.70 = **15.1 GHz clock rate**

1.6a) Global CPI = Σinstruction count x CPI / total num instructions
Class A = 0.10 x 10^6 = 100,000
Class B = 0.20 x 10^6 = 200,000
Class C = 0.50 x 10^6 = 500,000
Class D = 0.20 x 10^6 = 200,000
Global CPI1 = Σ(100,000x1) + (200,000x2) + (500,000x3) + (200,000x3) / 1,000,000 = **2.6**
Global CPI2 = Σ(100,000x2) + (200m00x2) + (500,000x2) + (200,000x2) / 1,000,000 = **2.0**
b) Clock cycles P1 = 1,000,000 x 2.6 = **2,600,000 cycles**
Clock Cycles P2 = 1,000,000 x 2.0 = **2,000,000 cycles**

1.7a)

1.11

1.12