SOLUTIONS CHAP 1

1. Figures 1.1 and 1.2 are somewhat similar. A ratio scale would make fig 1.1 almost linear, just like fig 1.4 did to fig 1.2.

2. With a growth rate of 8% per year, output doubles roughly every 9 years (=72/8).

3. In 48 years, income has increased by a factor of 4. This implies that it doubles every 24 years. We thus have $72/g = 24$, which implies that $g = 3\%$ per year.

4. According to the data, average income, or income per capita, is the same in both countries. This suggests an absence of inequality between countries of the world. However, there is obviously inequality between "citizens" of the world when viewed as a whole. Country A is more unequal than country B; inequality takes its source **within** the countries.

5. The formula for the annual growth rate is

$$g = \left(\frac{X_{t+n}}{X_t}\right)^{\frac{1}{n}} - 1.$$

Hence,

$$g = \left(\frac{29,639}{1,617}\right)^{\frac{1}{100}} - 1 = 2.95\%.$$

At this growth rate, income per capita in 2100 will be

$$X_{2100} = X_{2000}(1+g)^n = 29,639(1.0295)^{100} = 543,271!!!$$

6. Given the rate of growth of 1.8%, how long would it take for per capita income to grow from $4,034 to $41,099? We are looking for the value of n in the following equation:

$$41099 = 4034(1.018)^n$$

This can be expressed as $\ln 41099 = \ln 4034(1.018)^n$ or, equivalently, $\ln 41099 = \ln 4034 + n \ln 1.018$. This gives $n = 130$ years. Consequently, in year 2009-130=1879, per capita income in the USA was equal to that of Sri Lanka's in year 2009.

Problem A.2 in Appendix
a) GDP Poorland: $(3*1) + (1*1) = 4\$P$. GDP Richland: $(12*2) + (4*4) = 40\$R$.
b) Since computers are traded internationally, they must have the same prices once they have adjusted for exchange rates. Thus, one dollar in Poorland buys two dollars in Richland.
c) Using the market exchange rate, revenu per capita in Poorland, expressed in terms of Richland dollars, is 8R. Hence, Richland has an income per capita $40/8 = 5$ times larger.

d) A typical basket of consumption goods in both countries consists of 3 computers and 1 ice cream. In Richland, this costs 10$R. In Poorland, the same basket costs 4$P. The PPP exchange rate must insure that the basket costs the same in each of the two countries. So the PPP adjusted exchange rate is 10$R/4$P = 2.5$R/$P.

e) Using the PPP adjusted exchange rate, income per capita in Poorland is 4$P∗2.5$R/$P = 10$R. Richland is now only four times richer than Poorland as opposed to the factor of five calculated in part c) using the market exchange rate. This does correspond to the real output differences between the two countries.