1.2.4:
(a) We show it by induction.
For $[a_0] = [b_0]$, we have $a_0 = b_0$.
For $[a_0; a_1] = [b_0; b_1]$, we have $\frac{h_1}{k_1} = \frac{a_0 a_1+1}{a_1} = [a_0; a_1] = [b_0; b_1] = \frac{b_0 b_1+1}{b_1} = \frac{h_1'}{k_1'}$, and by corollary 1.36, $\frac{a_0 a_1+1}{a_1}$ and $\frac{b_0 b_1+1}{b_1}$ are in reduced form with $a_1, b_1 \geq 1$, so since they are equal, we have $a_1 \mid (a_0 a_1 + 1) b_1 \implies a_1 | b_1$ and similarly, $b_1 | a_1$ so $b_1 = a_1$. And then $a_0 = b_0$ too.

Now assume $[a_0, \ldots, a_{n-1}] = [b_0, \ldots, b_{n-1}]$. Then we have

$$a_0 + \underbrace{\frac{1}{[a_1; \ldots, a_n]}}_{\in(0,1]} = [a_0; a_1, \ldots, a_n] = [b_0; b_1, \ldots, b_n] = b_0 + \underbrace{\frac{1}{[b_1; b_2, \ldots, b_n]}}_{\in(0,1]}$$

where the element in $(0, 1]$ follows since $[a_1; \ldots, a_n]$ and $[b_1; \ldots, b_n]$ are positive since each a_i, b_j is positive. Since a_0 and b_0 are integers, we therefore have

$$|a_0 - b_0| = \left| \frac{1}{[a_1; \ldots, a_n]} - \frac{1}{[b_1; \ldots, b_n]} \right| \in [0, 1) \implies a_0 = b_0$$

since $a_0 - b_0 \in \mathbb{Z}$.

We then get
$$[a_1; \ldots, a_n] = [b_1; \ldots, b_n]$$
and by the inductive hypothesis, we then have $a_i = b_i$ for all $i = 0, \ldots, n$.
1.2.5 - (5 points):

```python
A = [2, 1, 2, 1, 1, 4, 1, 1, 6, 1]

def conv(S, n):
    H = [0, 1]
    K = [1, 0]
    for i in range(1,n+1):
        H.append(S[i-1] * H[i] + H[i-1])
        K.append(S[i-1] * K[i] + K[i-1])
    return [H[-1], K[-1]]

for i in range(1, len(A)+1):
    print(f"{i}: {conv(A,i)}")
```

The output was:
1: [2, 1]
2: [3, 1]
3: [8, 3]
4: [11, 4]
5: [19, 7]
6: [87, 32]
7: [106, 39]
8: [193, 71]
9: [1264, 465]
10: [1457, 536]

Where nth: $[h_n, k_n]$ gives the nth convergent as $\frac{h_n}{k_n}$.