CS101C Homework 3: Solutions

1. $\lambda x.t[x; y]$ and $\lambda x.x$
   Yes and unique. $t[\bullet; y] = \bullet$

2. $\lambda x.\lambda y.\lambda x.t[x; y]$ and $\lambda x.\lambda y.\lambda z.(x\ y)$
   No. The easies way to see it is to α-rename the second x in the pattern to z. Then the question becomes - can $\lambda x.\lambda y.\lambda z.t[z; y]$ match the term $\lambda x.\lambda y.\lambda z.(x\ y)$. Now the answer is clearly "no" because the pattern does not provide any way to have a free occurrence of x in the body of the λ.

3. $t[]\ t[]$ and $x\ \lambda x.x$
   No. The two $t[]$ in the meta-term should match the same thing.

4. $\lambda x.\lambda y.t_1[x; t_2[y]]$ and $\lambda u.\lambda v.(v\ (u\ \lambda x.x))$
   Yes and unique. $t_2[\bullet] = \bullet$ and $t_1[\bullet^1; \bullet^2] = \bullet^2\ (\bullet^1\ \lambda x.x)$.