

**Homework #11. Due: Thurs 12/7**

pg. 141, Exercise #10.

pg. 142, Exercises #11

**Hint:** You're given the following:

$$\begin{array}{ccc}
 X & \xrightarrow{f_A} & Y \\
 s \downarrow & & \downarrow t \\
 P & \xrightarrow{f_D} & Q
 \end{array}
 \quad
 \begin{array}{ccc}
 s' \downarrow & & \downarrow t' \\
 f_D \circ s = s' \circ f_A & & \\
 f_D \circ t = t' \circ f_A & &
 \end{array}$$

$$\begin{array}{ccc}
 Y & \xrightarrow{g_A} & Z \\
 s' \downarrow & & \downarrow t' \\
 Q & \xrightarrow{g_D} & R
 \end{array}
 \quad
 \begin{array}{ccc}
 s'' \downarrow & & \downarrow t'' \\
 g_D \circ s' = s'' \circ g_A & & \\
 g_D \circ t' = t'' \circ g_A & &
 \end{array}$$

And you need to construct proofs for:

1.  $(g_D \circ f_D) \circ s = s'' \circ (g_A \circ f_A)$
2.  $(g_D \circ f_D) \circ t = t'' \circ (g_A \circ f_A)$

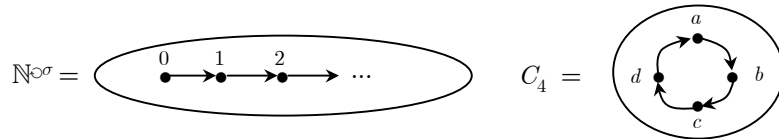
$$\begin{array}{ccc}
 X & \xrightarrow{g_A \circ f_A} & Z \\
 s \downarrow & & \downarrow t \\
 P & \xrightarrow{g_D \circ f_D} & R
 \end{array}
 \quad
 \begin{array}{ccc}
 s'' \downarrow & & \downarrow t'' \\
 & &
 \end{array}$$

pg. 177, Exercise #1.

**Hint:** An element  $x$  of a set equipped with endomap  $\alpha$  has both period 5 and 7 just when  $\alpha^5(x) = x$ , and  $\alpha^7(x) = x$ . To say  $x$  is a fixed point of  $\alpha$  means  $\alpha(x) = x$ .

pg. 178, Exercise #2.

**Hint:** Recall that  $\mathbb{N}^{\circ\sigma}$  and  $C_4$  look like:



and any  $\mathcal{S}$ -map  $f$  from  $\mathbb{N}^{\circ\sigma}$  to  $C_4$  must satisfy:

$$\begin{array}{ccc}
 \mathbb{N} & \xrightarrow{f} & C_4 \\
 \sigma \downarrow & & \downarrow \alpha \\
 \mathbb{N} & \xrightarrow{f} & C_4
 \end{array}
 \quad
 \alpha \circ f = f \circ \sigma$$