

MA 598 (Algebraic Geometry): Homework 1

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August 25, 2016

PROBLEM 1.1 (5-LEMMA)

Given a commutative diagram with exact rows

$$\begin{array}{ccccccc}
 0 & \longrightarrow & A & \longrightarrow & B & \longrightarrow & C \longrightarrow 0 \\
 & & \downarrow f & & \downarrow g & & \downarrow h \\
 0 & \longrightarrow & A' & \longrightarrow & B' & \longrightarrow & C' \longrightarrow 0,
 \end{array}$$

suppose f and h are isomorphisms. Prove that g is an isomorphism.

Solution. ►

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PROBLEM 1.2 (SNAKE LEMMA)

Given the diagram with exact rows

$$\begin{array}{ccccccc}
 & \text{Ker } f & \longrightarrow & \text{Ker } g & \longrightarrow & \text{Ker } h & \\
 & \downarrow & & \downarrow & & \downarrow & \\
 0 & \longrightarrow & A & \longrightarrow & B & \longrightarrow & C \longrightarrow 0 \\
 & & \downarrow f & & \downarrow g & & \downarrow h \\
 0 & \longrightarrow & A' & \longrightarrow & B' & \longrightarrow & C' \longrightarrow 0 \\
 & & \downarrow & & \downarrow & & \downarrow \\
 & & \text{Coker } f & \longrightarrow & \text{Coker } g & \longrightarrow & \text{Coker } h,
 \end{array}$$

show that the sequence

$$0 \longrightarrow \text{Ker } f \longrightarrow \text{Ker } g \longrightarrow \text{Ker } h \longrightarrow \text{Coker } f \longrightarrow \text{Coker } g \longrightarrow \text{Coker } h \longrightarrow 0$$

is exact.

Solution. ►

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PROBLEM 1.3**Solution.** ▶

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PROBLEM 1.4**Solution.** ►

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PROBLEM 1.5

Solution. ►



PROBLEM 1.6**Solution.** ►

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