

line, is tangent to  $S$  if and only if it lies on a pencil of lines of  $X$  all tangent to  $S$ .

⌘ Suppose  $l_x \cap S = \{p_1, p_2, p_3, p_4\}$   $p_i$ 's distinct.  
 $\Rightarrow$  For each  $i$ ,  $\sigma(p_i) \cap X$  is singular. Let  $\sigma(p_i, h_i)$  be one of two lines of  $\sigma(p_i) \cap X$ , which contains  $x$ .  
 $\Rightarrow x \in \sigma(p_i, h_i) \subset T_x(X) \cap X$ .  
 $\Rightarrow T_x(X) \cap X = \bigcup_{i=1}^4 \sigma(p_i, h_i)$ , for otherwise

$\sigma(p_1, h_1) = \sigma(p_2, h_2) \Rightarrow p_1 = p_2 \Rightarrow$  Contradiction.  
 $\Rightarrow l_x$  is tangent to  $S$ .  $\Rightarrow$  By the result above, all the lines  $\{l_x\}_{x \in L}$  are tangent to  $S$ .

Suppose  $l_x$  is tangent to  $S$ . If  $l_x$  is not singular, then by the result on P764,  $l_x$  meets  $S$  in four distinct points, unless  $T_x(X) \cap X$  contains a multiple component.  $\Rightarrow$  Say,  $L$  is the multiple component.  $\Rightarrow l_x$  lies on  $L$ .

⌘

Note that if  $L \subset X$  is any pencil of lines, all tangent to  $S$ , then by Bertini they must all be tangent at the focus  $p_L$  of the pencil, i.e., the plane  $h_L$  of the pencil must be the tangent plane to  $S$  at  $p_L$ .