

## some typos in your lecture notes on AV, LEC, CFT and CM.

Below, the corrected text is given after the arrows ----> in the red color.

### Abelian Varieties (Version 2.0, March 16, 2008)

p4. ... which is nondegenerate **module torsion**. ---->  
... which is nondegenerate **modulo torsion**.

p15. A **Riemann form on E on X defines** a homomorphism ... ---->  
A **Riemann form E on X defines** a homomorphism ..

p16. (Proof of Lemma 3.6.)  
... (AG 5.40 et seqq.), this implies that ... ---->  
... (AG 5.40), this implies that ...

p20. (THEOREM 4.2.a) Let ... then  
 $H^r(V^{\prime}, F) = H^r(V, F) \otimes_{\mathbb{R}} \mathbb{R}^{\prime}$  --->  
 $H^r(V^{\prime}, F^{\prime}) = H^r(V, F) \otimes_{\mathbb{R}} \mathbb{R}^{\prime}$

p23. ... as predicted by the first isomorphism of the **lemma**. ---->  
... as predicted by the first isomorphism of the **Corollary**.

p24. 5.9 ... a coherent sheaf **on it the same as** to give a ... ---->  
... a coherent sheaf **on it is the same as** to give a ...

p24. 5.10 Similarly, ...  
... there is a canonical map  $\alpha^{\star} \alpha_{\star} M \rightarrow M$ . For ... -->  
... there is a canonical map  $\alpha^{\star} \alpha_{\star} : M \rightarrow M$ . For ...

p26. (Proof of 5.16) Look at this on  
... to the natural map (see ??) ... ---->  
... to the natural map (see 5.10) ...

p26. (Proof of the theorem of the cube.)  
... the Seesaw Principle and Proposition 5.18 show that ... ---->  
... the Seesaw Principle and Proposition 5.10 show that ...

p31. NOTES.  
... intersection theory since **the then existing** theory used that the variety ... ---->  
... intersection theory since **the existing** theory used that the variety ...

p35. Definition of  $\text{Pic}^0(A)$ .  
From the formula  $\lambda_D = (\deg D)^2 \lambda_{\{D\}}$  in (8.3), ... -->  
From the formula  $\lambda_D = (\deg D)^2 \lambda_{\{D_0\}}$  in (8.3), ... -->

p36. (REMARK 8.6)

... (scheme)  $\text{Ker}(\alpha)$  (see 8.10), and ... --->  
... (scheme)  $\text{Ker}(\alpha)$  (see 8.10, below), and ...

p37. (REMARK 8.7e)

By using the description of tangent vectors in terms of dual numbers (5.37, one ... --->

By using the description of tangent vectors in terms of dual numbers (AG 5.37), one

p40. and so if we let  $\Gamma$  ...

... of points  $(t, b)$  such  $F$ ... ---> ... of points  $(t, b)$  such that  $F$ ...

p40. When  $k$  has nonzero characteristic, the theory is the same in outline, --->

When  $k$  has nonzero characteristic, the theory is the same as in outline,

p46. We want to define ...

... defined over a field an arbitrary field.. Write ... --->

... defined over a field as an arbitrary field. Write ...

p46. ... and so it natural to try definining ... --->

... and so it is natural to try definining ...

p46. The contradicts the earlier statement. --->

This contradicts the earlier statement.

p47. ... is called the Neron-Severi group  $\text{NS}(V)$  of  $V$ . --->

... is called the Neron-Severi group  $\text{NS}(V)$  of  $V$ .

p53. We shall that the  $m_i$  are all equal. --->

We shall show that the  $m_i$  are all equal.

p54. (REMARK 11.3.)

... of his conjecture (9.17) over finite fields... --->

... of his conjecture (10.17) over finite fields ...

p56. (PROOF ( OF THEOREM 12.1))

... and, in particular, that its dimension if ... --->

... and, in particular, that its dimension is ...

p59. PROOF of COROLLARY 13.5.

Apply the proposition to ... ---> Apply the proposition (13.2) to ...

p59. as follows: suppose ... , then

$e_{\{mn\}}(a, \lambda b^{\prime}) = e_{\{mn\}}(c, \lambda b)^n = \dots$  -->

$e_{\{mn\}}(a, \lambda b^{\prime}) = e_{\{mn\}}(c, \lambda b^{\prime})^n = \dots$

p61. PROOF of COROLLARY 13.13.

... , and (15.1) shows that ... --->

... , and (15.1, below) shows that ...

p68. PROOF of THEOREM 16.5.

... has finite kernel and image the subvariety of  $A$  generated by  $\alpha_1(B_1)$  and  $\alpha_2(B)$ . --->

... has finite kernel and image the subvariety of  $A$  generated by  $\alpha_1(B_1)$  and  $\alpha_2(B_2)$ .

p76. (actually, it easy to prove directly that ... --->  
(actually, it is easy to prove directly that ...

p76. Recall (10.20) that ... ---> Recall (I, 10.20) that ...

p78. COROLLARY 1.5 (in denominator)  
...  $P_{2g-2}$  ... ---> ...  $P_{2g-2}(t)$ ...

p78. This is called the category of ..  
... and (10.1) implies that ... --->  
... and (I,10.1) implies that ...

p79. For any simple abelian variety  $A$ ,  
... well-defined up to conjugacy (see 1.1). ---> ... well-defined up to conjugacy (see I, 1.1).

p86. (families of invertible sheaves of degree zero on  $C$  parametrized by  $T$ , modulo trivial families—cf. (4.16)). --->  
(families of invertible sheaves of degree zero on  $C$  parametrized by  $T$ , modulo trivial families—cf. (AG 4.16)).

p87. ... a regular ring. See (3.2). ---> ... a regular ring. See (3.2, below).

p87. ... by (??) a regular map, and we can form the fibre product: --->  
... by (1.5) a regular map, and we can form the fibre product:

p92. ... is an isomorphism Shafarevich 1994, III, 5.2. --->  
... is an isomorphism, see Shafarevich 1994, III, 5.2.

p96. In the PROPOSITION 3.7.  
horizontal map:  $X \rightarrow T^{\prime}$  --->  $T \rightarrow T^{\prime}$ , or  
left vertical map:  $X \rightarrow X$  --->  $X \rightarrow T$

p103.  
This last observation is the starting point of  
Chow's construction of the Jacobian Chow 1954.  
--->  
This last observation is the starting point of  
Chow's construction of the Jacobian, see Chow 1954.

p105. Assume again that  $C$  has a  $k$ -rational point  $P$ , ... , write  
 $L^{\prime}(D) = \dots = L(M^{-1}(D) - D \times J^{\checkmark} \times J \times D)$ . --->  
 $L^{\prime}(D) = \dots = L(M^{-1}(D) - D \times J^{\checkmark} - J \times D)$ .

p105. Recall (I 8.1 et seqq.), that  $D$  is ample... --->  
Recall (I 8.1), that  $D$  is ample ...

p108. Between  $J$  and  $J$  there is the divisorial correspondence ... -->  
Between  $J$  and  $J^{\check{}}$  there is the divisorial correspondence ...

p109. PROOF of THEOREM 7.3.

... and so  $\phi_{\tau} \circ \tau \phi_{\sigma} = \phi_{\sigma \tau}$  --->

... and so  $\phi_{\tau} \circ \tau \phi_{\sigma} = \phi_{\tau \sigma}$

p110. PROOF of PROPOSITION 7.4.

see Weil 1948b, **Theoreme 16, et seqq.**)

---> see Weil 1948b, **Theoreme 16.**)

p111. EXAMPLE 8.2.

(an element of  $k(C)$  is congruent to 1 modulo  $m$  if  $\text{ord}_P(f-1) \geq m$  ... --->

(an element of  $k(C)$  is congruent to 1 modulo  $m$  if  $\text{ord}_P(f-1) \geq m$  ...

p119. We know that ...

Therefore (11.3) completes the **proof**. --->

Therefore (11.3) completes the **proof of the theorem (11.1)**.

p121. PROOF of COROLLARY 12.3.

...  $C$  has **generic fibre the Jacobian** of  $C$  and ... --->

...  $C$  has **generic fibre of the Jacobian** of  $C$  and...

p124. (PROOF of LEMMA 13.5.) Fix an  $x$ ;...

... of  $r$ , and so there **exist**  $b$  for which ... --->

... of  $r$ , and so there **exists**  $b$  for which ...

p131. In other words, ...

... subgroup of  $A.k^{\text{al}}$  / stable under the **action of**  $\Gamma$ . --->

... subgroup of  $A.k^{\text{al}}$  / stable under the **action of**  $\text{Gal}(k^{\text{al}}/k)$ .

p132. The action of a finite group

... automatically semisimple (see **10.2**). --->

... automatically semisimple (see **I, 10.2**).

p132. The Tate conjecture has been discussed already in **(10.17)**. --->

The Tate conjecture has been discussed already in **(see I, 10.17)**.

p133. ... and so the formula for the height becomes

$H(P) = \max_i a_i$  (usual absolute value). --->

$H(P) = \max_i (a_i)$  (usual absolute value).

p135. LEMMA 2.1

... of degree prime to **char**. ---> ... of degree prime to **char(k)**.

p135. (PROOF of LEMMA 2.1)

**P ROOF**. Over  $k^{\text{al}}$ , this follows from **(8.10)**. ---> Over  $k^{\text{al}}$ , this follows from **(I, 8.10)**.

p135. LEMMA 2.2b

with the order of  $C$  equal to the power of  $l$  dividing  $\deg(\alpha)$ .  $\rightarrow$   
with the order of  $C$  equal to the power of  $l$  dividing  $\deg(\alpha)$ .

p135. (PROOF of LEMMA 2.2b) To prove this, consider the following infinite diagram:  
first horizontal row:  $A_{l^n}(k_{al}) \rightarrow A_{l^n}(k_{al})$

p136. LEMMA 2.3

... there an abelian variety  $B$  and ...  $\rightarrow$  ... there is an abelian variety  $B$  and ...

p136. Let  $A$  be an abelian variety over a field  $k$ , and let  $l$  be a prime  $\neq \text{char}(k)$ .  $\rightarrow$   
Let  $A$  be an abelian variety over a field  $k$ , and let  $l$  be a prime  $\neq \text{char}(k)$ .

p137. Let  $A$  be an abelian variety. Then ..

... algebra over  $\mathbb{Q}$  (10.15) ...  $\rightarrow$  ... algebra over  $\mathbb{Q}$  (I, 10.15) ...

p137. Let  $A$  be an abelian variety. Then ..

(see the first subsection of & 9).  $\rightarrow$

(see the first subsection of I, & 9).

p138. Since the elements of  $\Gamma$  ..

... under the action of  $\Gamma$ . (b) Let  $C$  be the centralizer of ...  $\rightarrow$

... under the action of  $\Gamma$ . \\\

(b) Let  $C$  be the centralizer of ...

p141. (PROOF of THEOREM 3.5.)

As we noted in & 20,  $\rightarrow$

As we noted in AG & 20,

p142. Recall that for an abelian variety ...

... and its roots all have absolute value  $q^2$  (&& 9,16).  $\rightarrow$

... and its roots all have absolute value  $q^2$  (III, 11.1).

p142. LEMMA 3.8. ...  $S$ ,  $l$ , and  $d$  and from disjoint from ...  $\rightarrow$

...  $S$ ,  $l$ , and  $d$  and disjoint from ...

p144. Recall from (15.1) that, ...  $\rightarrow$

Recall from (I, 15.1) that, ...

p144. Recall that associated with any complete smooth curve...

(We noted in (18.5) that, when ...  $\rightarrow$  (We noted in (I, 18.5) that, when ...

p145. (PROOF OF 4.1)

The construction of the Jacobian variety sketched in (& 17) works over  $\mathbb{R}$  ...  $\rightarrow$

The construction of the Jacobian variety sketched in (I, & 17) works over  $\mathbb{R}$  ...

p146. THEOREM 5.2 (DE FRANCHIS) ... and the curve

$C^{\{\prime\}}$ :  $Y^2 = f_1(X) \dashrightarrow$   
 $C^{\{\prime\}}$ :  $Y^2 = f_1(X) \dashrightarrow (\star)$

p147. Next fix a pair of distinct ...  
... good reduction on **as large a set as possible** ...  $\dashrightarrow$   
... good reduction on **as large set as possible** ...

p148. PROOF (OF 5.1)  
... (see 7.2).  $\dashrightarrow$  ... (see I, 7.2).

p153. We can make this more explicit by using the expression (26.2.1) for  $H(M)$ .  $\dashrightarrow$   
We can make this more explicit by using the expression (6.2, pp 151) for  $H(M)$ .

p156 REMARK 7.11.  
The semistability condition is essential, **for consider** an elliptic curve ...  $\dashrightarrow$   
The semistability condition is essential, **for example consider** an elliptic curve ... -

p157 Step 1.  
Because  $A_0$  and  $A$  have **semstable stable** reduction everywhere, ...  $\dashrightarrow$   
Because  $A_0$  and  $A$  have **semistable** reduction everywhere, ...

p157 Step 2. Proof:  
... extension of  $K$  of degree  $\leq \# \text{GL}_{\{2g\}}(F_1) \mathbb{Z} / 1 \mathbb{Z}$  unramified outside  $S$  ...  $\dashrightarrow$   
... extension of  $K$  of degree  $\leq \# \text{GL}_{\{2g\}}(F_1) (\mathbb{Z} / 1 \mathbb{Z})$  unramified outside  $S$  ...

## Lectures on Etale Cohomology (Version 2.10, May 20, 2008)



p11. Take  $n=2$  ..  
... but **not the** Zariski topology.  $\dashrightarrow$   
... but **not for the** Zariski topology.

p13. The **answer is to (1.5) is:** ...  $\dashrightarrow$   
The **answer to (1.5) is:** ...

p17. (Proof of 2.2 ) The map ..  
... follows from the **theorem**.  $\dashrightarrow$   
... follows from the **Proposition**.

p27. The action of ...  
is **given the** discrete topology—  $\dashrightarrow$   
is **given by the** discrete topology—

p27. The same argument ...  
... and tamely ramified over  $\infty$ .  $\dashrightarrow$   
... and tamely ramified over  $\infty$ , **see 3.2**.

p29. Let  $\tilde{k} = \dots$

... be the **projective system consisting** of all finite ... --->  
... be the **projective system consisting** of all finite ...

p33. Therefore (2.14), there exists a  $\prime$  ... --->  
Therefore **by** (2.14), there exists a  $\prime$  ...

p34. ... relatively **prime, then then**  $f = \dots$  --->  
... relatively **prime, then**  $f = \dots$

p41. Galois coverings  
... then to **give an right** action of  $G$  ... --->  
... then to **give a right** action of  $G$  ...

p44. (6.10 d)  
in the **variables  $n^2 + 1$  variables**  $T$ , ... --->  
in the  **$n^2 + 1$  variables**  $T$ , ...

p54. Lest the **reader think** that ... --->  
Lest the **readers think** that ...

p57. Direct images of sheaves  
In general, **this will map will be** neither injective nor surjective. --->  
In general, **this map will be** neither injective nor surjective.

p58. Proof of 4.8 (a): Confinal set, (define it in a footnote, somewhere. It comes first time in the proof of 4.8 pp34 where it is nearly described as sets with same etale nbds), see proof of 4.8.

p64. The dimension axiom.  
... defines an equivalence from the category of sheaves on  $\mathbf{x}_{\text{et}}$  to the category of discrete ... --->  
... defines an equivalence from the category of sheaves on  $\mathbf{X}_{\text{et}}$  to the category of discrete ...

p66. Excision (Proof of 9.7)  
... that the map  $\Gamma_Z(X, F) \rightarrow \Gamma_{Z^{\prime}}(Z^{\prime}, F|_{X^{\prime}})$   
in the above diagram is an isomorphism.

--->  
... that the map  $\Gamma_Z(X, F) \rightarrow \Gamma_{Z^{\prime}}(X^{\prime}, F|_{X^{\prime}})$   
in the above diagram is an isomorphism.

(else  $Z^{\prime} \subset X^{\prime}$  does it as an embedding)

p68. Definition of the Čech groups.  
10.1  
...  $H^r(G, P(Y))$  (group cohomology); --->  
...  $H^r(G, P(Y))$  (group cohomology);  
(gap between ... ) and ( group .. )

p80. (EXAMPLE 12.5)  
**A** an integral domain ---> **A** an integral domain  
**K** the field of fractions of  $A$  ---> **K** the field of fractions of  $A$   
 $\tilde{A}$  the integral closure of  $A$  in  $K$  --->  $\tilde{A}$  the integral closure of  $A$  in  $K$

p80. ... use the Kummer sequence (7.9) to compute ... --->  
... use the Kummer sequence (7.9 a) to compute ...

p86. (PROOF of 13.8)

... and so  $H^r(X_{\text{et}}, i_{x^{\star}} F) = H^r(x_{\text{et}}, F) = 0$  ... --->  
... and so  $H^r(X_{\text{et}}, i_{x^{\star}} F) = H^r(X_{\text{et}}, F) = 0$  ...

p89. (14.3)

... = 0 for  $r \neq 2$  ---> ... = 0 for  $r \neq 2$

p89. (PROOF of 14.3)

... (Theorem 13.7 also applies to V) ... --->  
... (Theorem 13.7 also applies to V) ...

p89. (PROOF of 14.3)

...,  $H^r_x(V, G_m) = 0$  for  $r \neq 1$ . --->  
...,  $H^r_x(V, G_m) = 0$  for  $r \neq 1$ .

p91. (The Poincare duality theorem.)

For a discussion ..  
spaces, see the & 24. ---> spaces, see the & 24, below.

p96. (Curves over finite fields.) Let U be a connected

...  
 $H^r(\Gamma, M) = M^{\Gamma}, M^{\Gamma}, 0$  respectively ... --->  
 $H^r(\Gamma, M) = M^{\Gamma}, M^{\Gamma} = 0$  respectively ...

p98. An exact sequence in the Galois cohomology of a number field.

Theorem 14.19 is a very important ... --->  
Theorem 14.19 is a very important ...

p134. (Proof of 23.1)

For  $r = 1$ , this is the map defined by the Kummer sequence. --->  
For  $r = 1$ , this is the map defined by the Kummer sequence (see 7.9a).

p140. The Gysin map (24.2e)

... =  $\pi_{\star}(y) \cup x$  for  $x \in H^r(X)$  and  $y \in H^s(X)$ . --->  
... =  $\pi_{\star}(y) \cup x$  for  $x \in H^r(X)$  and  $y \in H^s(X)$ .

p144. (Proof 25.6)

Because  $\text{Tgt}_{\{P,P\}}(\Delta)$  is the ... --->  
Because  $\text{Tgt}_{\{P,P\}}(\Delta)$  is the

p144. (Proof 25.6)

... and  $\text{Tgt}_{\{P,P\}}(\Delta)$  is the ... --->  
... and  $\text{Tgt}_{\{P,P\}}(\Delta)$  is the ...

p145. (26. THE WEIL CONJECTURES) Let ...

... of  $F_q$  degree m. ---> ... of  $F_q$  with degree m.



p147. ... and we shall see in the next section (27.9.1) that ... --->  
... and we shall see in the next section (27.9a) that ...

p152. (Proof of THEOREM 27.12) By definition of  $F_{\star}$ ,  
 $\dots = \eta_X(x \cup F_{\star}(x^{\prime})) \times \in H^{2d-r}(X), \dots \rightarrow$   
 $\dots = \eta_X(x \cup F_{\star}(x^{\prime})), x \in H^{2d-r}(X), \dots$

p155. (EXERCISE 28.2)  
... ; in fact, it **has as basis the** classes of any ... --->  
... ; in fact, it **has basis as the** classes of any ...

p158. (Coefficient ring finite)  
... may not **be free a free** -module, ... --->  
... may not **be a free** -module, ...

p160. The same argument as in & 27 (see 27.9.1) shows that ... --->  
The same argument as in & 27 (see 27.9a) shows that ...

p162. (29.11)  
The left action of **R becomes** a right action on  $\hat{V}$  ... --->  
The left action of **R on V becomes** a right action on  $\hat{V}$  ...

p162. (29.12) Let  $E_0$  ...  
there **is a isomorphism** ... --->  
... there **is an isomorphism** ...

p164. (29.17) Let  $R$  be a commutative local Noetherian ....  
... be an **endomorphism  $M^{\dot{}}$** . ---> ... be an **endomorphism of  $M^{\dot{}}$** .

P172. (30.6) .. Then: (b)  
... is rational, and **its eigenvalues all have** absolute ... --->  
... is rational, and **its all eigenvalues have** absolute ...

P177. Now the duality theorem (32.3) gives a canonical ... --->  
Now the duality theorem (32.3, below) gives a canonical ...

p182. In particular,  
It is the group of vanishing **cycles**<sup>5</sup>. Note that ... --->  
It is the group of vanishing **cycles**<sup>5</sup>. Note that ...

p191. For example, let  $X$  ...  
... elliptic curves, **except for a for a finite** number of ... --->  
... elliptic curves, **except for a finite** number of ...

p.20 COROLLARY 1.2

(d)  $Nm(L \cap L^{\times}) = \dots \rightarrow$

(d)  $Nm(L \cap L^{\prime})^{\times} = \dots$

p.20 (PROOF of COROLLARY 1.2 )

Note that the transitivity of norms,

$Nm_{L^{\prime}/L} = Nm_{L/K} \circ Nm_{L^{\prime}/L};$

$\rightarrow$

Note that the transitivity of norms,

$Nm_{L^{\prime}/L} = Nm_{K/L} \circ Nm_{L^{\prime}/K};$

p.33 ... element of  $K$ ; and  $\rightarrow$

... element of  $K$ ; and

p.34 ... homomorphism follows from Lemma 2.15 and the  $\rightarrow$

... homomorphism follows from Proposition 2.15 and the  $\dots$

p.34 ... power series  $G(X) = -X + \sum_{i=2}^{\infty} a_i X^i$  such that  $\dots \rightarrow$

... power series  $G(X) = -X + \sum_{i=2}^{\infty} a_i X^i$  such that  $\dots$

p.35 (It is easy to construct.. ) ... such that  $ml^{p^f-1}$ .  $\rightarrow$

... such that  $ml^{(p^f-1)}$ .

p.44 Thus  $(G_0: G_1) \mid q-1$  and  $\dots \rightarrow$

Thus  $(G_0: G_1) \mid (q-1)$  and  $\dots$

p.45 PROOF. See Serre 1962, IV.3, Pptn 14.  $\rightarrow$

PROOF. See Serre 1962, IV.3, Proposition 14.

p.46 It is does not require  $\dots \rightarrow$

It does not require  $\dots$

p.46 If there existed field  $L_t$   $\dots \rightarrow$

If there existed a field  $L_t$   $\dots$

p.55 (REMARK 1.1 ) ... with basis the elements of  $\dots \rightarrow$

... with basis as the elements of  $\dots$

p.61 ... of  $G$ , endowed the action of  $\dots \rightarrow$

... of  $G$ , endowed with the action of  $\dots$

p.66 (FUNCTORIAL PROPERTIES OF THE COHOMOLOGY GROUPS)

Let  $\dots$

$\alpha : G^{\prime} \rightarrow G, \beta \dots \rightarrow$

$\alpha : G \rightarrow G^{\prime}, \beta \dots$

p.67 ... the composite of the homomorphism this defines on  $\dots \rightarrow$

... the composite of this homomorphism as defined on ...

p.74 ... The two maps we have constructed are inverse. --->  
The two maps we have constructed are inverse of each other.

p.82 ... abelian group with basis the elements ... --->  
... abelian group with basis as the elements ...

p.86 L EMMA A.1  
The exact commutative diagram in blue  
gives rise to the exact sequence in red:

( blue, red) ---> (bold, unbold)  
to appear in b/w printing

p.88 ( INJECTIVE OBJECTS) ... exact in C implies that ... --->  
... is exact in C implies that ...

p.95 All cohomology groups will computed using ... --->  
All cohomology groups will be computed using ...

p.103 Eqn (26)  
 $\text{inv}_L \circ \text{Res} = \dots \rightarrow \text{inv}_L \circ \text{Res}_{\{L/K\}} = \dots$

p.104 Eqn (27)  
 $\text{inv}_L \circ \text{Cor} = \dots \rightarrow$   
 $\text{inv}_L \circ \text{Cor}_{\{L/K\}} = \dots$

p.104 ... second square commutes, and (3.15) that the ... --->  
second square commutes, and (see I, 3.11 and III, 1.7) that the ...

p.112 ... the boxed formula above. --->  
...the boxed formula above given on pp. 111.

p.114 ... these properties (Corollary 1.2), but ... --->  
... these properties (see I, 1.2), but ...

p.133 These remarks show that ...  
... defines a injection ... --->  
... defines an injection ...

p.134 footnote  
... p126–128, for the details. --->  
... pp126–128, for the details.

p.140 Thus,  $K_2 F$  has as generators pairs  $\{a, b\}$ , one for each pair of elements in  $F^{\times}$ ,  
and relations --->  
Thus, as generators pairs  $\{a, b\}$ , one for each pair of elements in  $F^{\times}$ ,  $K_2 F$  has the  
following relations

p.143 We use **S** denote a finite set ... --->  
We use **S** to denote a finite set ...

p.144 ... numbers dividing **and** integer  $n$ , ... --->  
... numbers dividing **an** integer  $n$ , ...

p.152 ... Theorem (see 3.6). --->  
... Theorem (see 3.6, **below**).

p.152 Let  $L=K$  be a finite abelian **extension Galois** group  $G$ . --->  
Let  $L=K$  be a finite abelian **extension with Galois** group  $G$ .

p.159 REMARK 3.22  
... so **on, to obtain** a tower ... --->  
... so **on, obtain** a tower ...

p.159 REMARK 3.22  
 $\tau K^{\{\prime\}} = K$ ,  $\tau K^{\{\prime\} \{\prime\}} = K^{\{\prime\} \{\prime\}}$ , etc., ... --->  
 $\tau K^{\{\prime\}} = K$ ,  $\tau K^{\{\prime\} \{\prime\}} = K^{\{\prime\}}$ , etc., ...

p.161 Example 3.29  
...  $\chi$  **an an** injective character ... --->  
...  $\chi$  **and an** injective character ...

p.162 ... and hence Artin L-series **with** Dirichlet L-series. --->  
... and hence Artin L-series **coincides with** Dirichlet L-series.

p.164 NOTES  
Artin defined his **map and proved it gave** an isomorphism ... --->  
Artin defined his **map, proved it and gave** an isomorphism ...

p.165 ... (for which the product **formula** holds), --->  
... (for which the product **formula (31)** holds),

p.165 Recall that, ... in fact (in the series)  
 $\hat{p}^3$  --->  $\hat{p}_v^3$

p.170 REMARK 4.9  
In practice, it is **more usually more convenient** to identify ... --->  
In practice, it is **usually more convenient** to identify ...

p.170 REMARK 4.9  
... without changing the **value**  $\phi(a)$ . --->  
... without changing the **value of**  $\phi(a)$ .

p.170 Example 4.10  
... to  $\psi$  as in the theorem. --->  
... to  $\psi$  as in the Proposition 4.7.

p.171 REMARK 4.11  
in Proposition 4.7.). --->  
as in the Proposition 4.7.).

p.174 (Theorem 5.3) We saw ...  
... factor through  $I_K / K^{\times}$ .  $Nm(I_L)$ . Part (b) can ... --->  
... factor through  $I_K / (K^{\times} \cdot Nm(I_L))$ . Part (b) can ...

p.185 EXAMPLE 2.13 (b)  
... the formula becomes  $2\log(u) h_k / \sqrt{\Delta}$ , ... --->  
... the formula becomes  $2\log(u) h_k / |\sqrt{\Delta}|$ , ...

p.203 We now complete the proof of the Theorem. --->  
We now complete the proof of the Proposition.

p.203 The product formula shows  $M^0$  is ... --->  
The product formula shows that  $M^0$  is ..

p.205 (Proof 4.5)  
... then the exists a subfield ... --->  
... then there exists a subfield ...

p.207 (Proof 5.3) ... dividing the orders .... --->  
... dividing the orders of ...

p.209 ... Second Inequality in the case the  $K$  contains ... --->  
... Second Inequality in the case that  $K$  contains ...

p.212 This is accomplished by the next two lemmas ... --->  
This is accomplished by the next lemma and Proposition ... --->

p.219 Because  $L=K$  is has exponent  $p$ , ... --->  
Because  $L=K$  has exponent  $p$ , ...

p.223 ... if it has a root  $k$ . --->  
... if it has a root of  $k$ .

p.225 (EXAMPLE 2.2) ...  
construct a cyclic such extension. --->  
onstruct such a cyclic extension.

p.231 Assume now that  $n \geq 5$  and that Theorem 3.1b has ... --->  
Assume now that  $n \geq 5$  and that Theorem 3.5b has ... --->

p.235 According to , the Artin map ... --->  
According to this, the Artin map ...

p.241 By definition ..  
... and  $i^{\prime} j^{\prime} = \zeta i^{\prime} j^{\prime}$ . --->

.... and  $i^{\prime} j^{\prime} = \zeta j^{\prime} i^{\prime}$ .

p.245 and let ...

If, **addition**, ...  $\rightarrow$  If, **in addition**, ...

p.246 (Proof 6.3)

On applying Theorem 3.5, to  $q^{\prime} - aZ^2$ , we find that ...  $\rightarrow$

On applying Theorem 3.5 to  $q^{\prime} - aZ^2$ , we find that ...

p.246 (Proof 6.3)

... forms  $q_1$  and  $q_2$  of rank  $n - 1$ . Now (6.2) shows that  $q_1 \sim q_2$  over  $K_v$  for all  $v$ , and ...  $\rightarrow$

... forms  $q_1$  and  $q_1^{\prime}$  of rank  $n - 1$ . Now (6.2) shows that  $q_1 \sim q_1^{\prime}$  over  $K_v$  for all  $v$ , and ...

p.250 We say ...

... is **realizable there exists** a quadratic form ...  $\rightarrow$

... is **realizable f there exists** a quadratic form ...

p.255 (10 More on L-series) ... satisfies the functional equation ...

...  $(1-s, \bar{\chi}) \mid W(\chi) \mid = 1 \rightarrow$

...  $(1-s, \bar{\chi}), \mid W(\chi) \mid = 1$

p.265 (Solution to Exercise A-4.)

Recall (notes 5.9) that ...  $\rightarrow$

Recall (notes V, 5.9) that ...

p.265 (Solution to Exercise A-4.)

... of finite index, **as is its inverse image in  $C_Q$** .  $\rightarrow$

... of finite index, **as its inverse image is in  $C_Q$** .

## Complex Multiplication (April 7, 2006):

p.16 (Proof of 1.21) Let  $\Omega$  be any finite Galois **extension  $\Omega$  of  $k$**  containing ...  $\rightarrow$

Let  $\Omega$  be any finite Galois **extension of  $k$**  containing ...

p.25 (Proof of 2.6) ... (Hatcher 2002, 3.16 et seq.) **shows that if** ...  $\rightarrow$

... (Hatcher 2002, 3.16) **shows that if** ...

p.30 (3.8) ... a field with Galois group **A5 and can not be CM**.  $\rightarrow$

... a field with Galois group **A5 can not be CM**.

p.45 (After PROPOSITION 4.24: Diagram of the left)

**$S^*K(Q) \rightarrow S^*K(Q)$**

p.45 (PROPOSITION 4.25) In Equation (42),  $E$  is not specified,  $\rightarrow$

for example,  $E$  may be taken as ( $E=K$ ), or ( $F \subset E \subset K$ , as in  $E^{\star}$ ), or ( $E = \text{End}^{\{0\}}(A)$ ), or ( $E$  is a number field of CM type), or ( $E$  is a CM algebra over  $K$ ), or ( $E$  is a CM field).

p.50 (6.2) ... and  $k'$  is a one-dimensional  $k$ -vector space ... --->  
... and  $k'$  is an one-dimensional  $k$ -vector space ...

p.52 (Proof of 6.5) ... After possibly replacing  $U$  a smaller open set, ... --->  
... After possibly replacing  $U$  by a smaller open set, ...

p.56 ( Let  $g = \dots$ )  
... not equal to  $\text{char } k$ . --->  
... not equal to  $\text{char}(k)$ .

p.64 (PROPOSITION 7.31) Let  $A$  be a commutative algebraic group  $A$  over a field  $k$  ... --->  
Let  $A$  be a commutative algebraic group over a field  $k$  ... --->

p.64 (Proof of PROPOSITION 7.31)  
For an algebraic closure  $\bar{k}$  of  $k$  and a prime  $l \neq \text{char } k$ ; --->  
For an algebraic closure  $\bar{k}$  of  $k$  and a prime  $l \neq \text{char}(k)$ ;

p.65 (Proof of PROPOSITION 7.35) ... by (??), from which this follows. --->  
... by (7.25), from which this follows.

p.66 (a-multiplications (3))  
To see this, choose a basis for  $a_1, \dots, a_n$  for  $a$ , and ... --->  
To see this, choose a basis  $a_1, \dots, a_n$  for  $a$ , and ... --->

p.67 (Proof of PROPOSITION 7.39)  
... principal ideals map to  $A$ . --->  
... principal ideals map to  $A$ .

p.71 (Corollary 8.7) (a) Let  $\sigma$  be the Frobenius element  $(P; k/E^{\star})$ ; ... --->  
Let  $\sigma$  be the Frobenius element of  $(P; k/E^{\star})$ ; ...

p.81 (Proof of Lemma 9.13)  
It follows easily that ... --->  
It follows easily that ...

p.82 (Proof of Lemma 9.13)  
In order to prove Theorem 9.10, ... --->  
**Proof of Theorem 9.10:** In order to prove Theorem 9.10, ...

p.82 (in footnote 28) ... and  $\alpha^{\prime}: A \rightarrow A^{\prime}$ , and let ... --->  
... and  $\alpha^{\prime}: A \rightarrow A$ , and let ... (to get the given isogeny).

p.89 (Denote  $\dots$ ) ... (i.e., have residue field the prime field) ... --->  
... (i.e., have residue field of the prime field) ...

p.91 THEOREM 10.1 (b)  
It is possible to choose  $\theta^{\prime}$  so that  
**DIAGRAM**

commutes, ... --->

It is possible to choose  $\theta^{\prime}$  so that

**DIAGRAM**

(there should be an arrow in the middle with  $f: E/a \rightarrow E/fa$ )

commutes, ...

p.92 Definition of  $f_{\Phi}(\sigma)$  --->

Definition of  $f_{\Phi}(\sigma)$  (following Tate.)

p.96 (Proof of PROPOSITION 10.12)

(d) This was proved in (10.11d). --->

(d) This was proved in (10.11b).

p.97 ( Completion of the proof (following Deligne))

... to show **that for, for any** prime numbers ... --->

to show **that, for any** prime numbers

p.97 ... and so it **suffices (82) for** E ... --->

... and so it **suffices to check (82) for** E ...

p.106. ...it **is any isogeny**, and there is ... --->

... it **is an isogeny**, and there is ...