

Corrections to the second printing of  
**Commutative Algebra with a View Toward Algebraic Geometry**

This file contains all the corrections to the second printing that I knew of as of 9/7/98. References are of the form **n;m**, where n is a page number in the second printing, m a line number. Descriptive matter (that is, things not actually appearing in the text) is surrounded by double parentheses ((like this)).

—David Eisenbud

---

**on title page, or somewhere else prominent**

Insert:

Third corrected printing

---

**22; 15.**

Replace:

is an

by:

is a primitive

---

**35; 8.**

Delete:

reduced

---

**36; -7.**

After

category of

insert:

reduced

---

**43; -13.**

Replace:

this is

by:

we make the convention that this is

---

**52; 8-15.**

Replace:

((the labels a-h))

by:

((the numbers 1-8))

---

**52; -8.**

Replace:

a and b

by:

1 and 2

---

**52; -7.**

Replace:

g and h

by:

7 and 8

---

**52; -4.**

Replace:

c,d and h

by:

3,4 and 8

---

**57; -2.**

Replace:

3.5

by:

I.3.6

---

**67; 9.**

After

ideals

insert:

$P$

---

**83; 1-2.**

Replace:

$x$

by:

$f$  ((two occurrences))

---

**90; -7.**

Replace:

union

by:

finite union

---

**111; 12.**

Replace:

in press

by:

1995

---

**118; -8.**

Replace:

algebra

by:

algebraic

---

**118; -5.**

After

).

insert:

Assuming that  $X$  and  $Y$  are affine, so is  $Y'$ , and its coordinate ring is the normalization of the image of  $A(Y)$  in  $A(X)$ .

---

**124; 4.**

Replace:

Lemma

by:

Theorem

---

**129; -14.**

Replace:

Hartshome

by:

Hartshorne

---

**130; fig 4.4.**

Replace:

((the upside down U))

by:

$\cap$

---

**139; -10 .**

Before

Let

insert:

((as a new part a.))

a. Show that the quotient field of  $k[\Gamma]$  is  $k[G(\Gamma)]$ .

---

**139; -7.**

Replace:

its quotient field

by:

$k[x_1, \dots, x_n]$

---

**139; -6.**

Replace:

a.

by:

b.

---

**140; 3.**

Replace:

b.

by:

c.

---

**140; 5–10.**

Delete:

the whole of part d.

---

**140; 12.**

After

{

insert:

(

---

**149; -20.**

After

ideal

insert:

such

---

**154; Figure 5.2, first line under the left-hand picture.**

Replace:

in  $(y^2)$

by:

$\text{in}(y^2)$

---

**159; -8.**

Replace:

$a \neq 0$

by:

$0 \neq a$

---

**187; -8.**

Replace:

equation

by:

expression

---

**187 ;-2.**

Replace:

$5/32$

by:

$5/128$

---

**189; 5.**

Replace:

$e_j$

by:

$\sum_{j \neq i} e_j$

---

**189; 6.**

After

$= 0$

insert:

for each  $j \neq i$

---

**189; 6.**

Replace:

$m = e_j(n')$

by:

$m = \sum_{j \neq i} e_j(n'_j)$

---

**189; 7.**

Replace:

$n_j \in M$

by:

$n'_j \in M$

---

**189; 7.**

Replace:

$e_j(m) = \dots = m$

by:

$\sum_{j \neq i} e_j(m) = \sum_{j \neq i} e_j(\sum_{j \neq i} e_j(n'_j)) = \sum_{j \neq i} e_j(n'_j) = m$

---

**189; 8.**

Replace:

$$e_j(M)$$

by:

$$\sum_{j \neq i} e_j(M)$$

---

**189; -18.**

Delete:

[ $x$ ] ((three occurrences))

---

**189; -15.**

After

(commutative)

insert:

local

---

**189; -4.**

Replace:

$$\bar{e}_1$$

by:

$$e_1$$

---

**190; 18.**

After

((end of line))

insert:

Also, the hypothesis “local” is unnecessary: see Proposition 7.10.

---

**194; 4.**

Replace:

((the first subscript))  $_j$

by:

((the subscript))  $_n$

---

**195; 4.**

Replace:

$$m$$

by:

((fraktur))  $m$

---

**195; 15.**

Replace:

$$1 + x$$

by:

$$1 - x$$

---

**195; 17.**

Replace:

$$1 + a$$

by:

$$1 - a$$

---

**195; 19.**

Replace:

$$1 - a + a^2 - \dots$$

by:

$$1 + a + a^2 \dots$$

---

**195; 20.**

Replace:

$$1 + a$$

by:

$$1 - a$$

---

**195; 21.**

Replace:

((the display))

by:

$$(1 - a) + (1 - a)a + (1 - a)a^2 \dots$$

---

**195; 22.**

Replace:

$$1 + a^i$$

by:

$$1 - a^i$$

---

**200; -15.**

After

for each  $i$

insert:

and taking convergent sequences to convergent sequences

---

**201; 17.**

Replace:

$$)^{i+j}$$

by:

$$)^{i+j-1}$$

---

**203; 19.**

Replace:

A1.3c

by:

A1.4c

---

**204; 9.**

Delete:

$$\tilde{K} \subset$$

---

**204; 14.**

Replace:

$$\tilde{a} \in \dots = \tilde{K}$$

by:

$$\tilde{a} \in R$$

---

**204; 16.**

Replace:

$$\tilde{K} = \varphi(K)$$

by:

$$\tilde{K} \subseteq \varphi(K)$$

---

**204; 19–20.**

Replace:

((entire lines 19-20))

by:

so  $\varphi$  is a homomorphism and  $\varphi(K)$  is a coefficient field containing  $\tilde{K}$ . The previous paragraph shows that  $\varphi(K) = \tilde{K}$

---

**204; -11.**

Before

Since

insert:

We may assume that  $\bar{u}'_w$  and  $\bar{r}_w$  are nonzero.

---

**204; -10.**

Replace:

$$k^q$$

by:

$$k$$

---

**217; 10.**

Replace:

1.15c

by:

1.15b

---

**227; -4.**

Replace:

Equivalently. it

by:

Equivalently, it

---

**230; 18.**

Replace:

dimension

by:

dimension

---

**237; -18.**

Delete:

and using Nakayama's lemma,

---

**238; -11 – -10.**

Replace:

parameter ideal

by:

ideal of finite colength on

---

**241; Figure 10.4.**

The  $X$  at the upper right should be  $Y$ ; the  $Y$  at the lower right should be  $X$

---

**242; 4.**

Replace:

$R_P/PR_P$

by:

$R/P$

---

**242; 6–8.**

Replace:

$R_P$

by:

$R$  ((three occurrences))

---

**244; 3.**

Replace:

the maximal ideal is generated by  $x$

by:

the maximal ideal is generated by  $y$

---

**244; 4.**

Replace:

$k[x]_{(x)}$

by:

$k[y]_{(y)}$

---

**244; 5.**

Replace:

$k(x)$

by:

$k(y)$

---

**248; 20.**

Replace:

dimension

by:

dimension

---

**253; -12.**

Replace:

$ar = bs$

by:

$r^n \in (s)$

---

**253; -12 – -11.**

Replace:

a zerodivisor... of  $s$ .

by:

nilpotent modulo  $(s)$  and is contained in the minimal primes of  $(s)$ .

---

**253; -11 – -11.**

Replace:

this

by:

each

---

**253; -10.**

Replace:

associated

by:

minimal

---

**254; -21**

Delete:

the end of proof sign at the end of the line

---

**254; -14.**

Replace:

Continuing

by:

To complete

---

**254; -14.**

Delete:

next

---

**255; 2.**

Insert:

the end of proof sign at the end of the line

---

**258; 17.**

Replace:

$R$

by:

$R_P$  ((two occurrences))

---

**258; 19.**

Replace:

Since... =0

by:

Since  $\ker(\varphi_i)_P \otimes R_P \varphi_i$  maps to  $(\varphi_i)_P \ker(\varphi_i)_P = 0$

---

**260; 4.**

After

$K(R)$

insert:

modulo the units of  $R$

---

**260; 10.**

Replace:

so it

by:

. We have  $Ru = Rv$  iff  $u$  and  $v$  differ by a unit of  $R$ , so we may identify the group of principal divisors, under multiplication, with the group  $K(R)^*/R^*$ . If  $I$  is any invertible divisor and  $Ru$  is a principal divisor, then  $(Ru)I = uI$ . Thus it

---

**276; -15 – -13.**

Replace:

Suppose... ((whole sentence))

by:

Suppose that  $q \subset R$  is an ideal of finite colength on  $M$ . (( $q$  should be fraktur))

---

**276; -1.**

Replace:

$M/x_1, M$  ((part of the subscript in the middle))

by:

$M/x_1M$  ((that is, delete the comma))

---

**277; -14 – -13.**

Replace:

parameter ideal

by:

ideal of finite colength on

---

**277; -11.**

Replace:

where... with

by:

where the polynomial  $F$  has

---

**277; -11.**

Replace:

whose degree is

by:

degree

---

**278; 2.**

Replace:

((comma at the end of the display))

by:

((period))

---

**278; 3,4.**

Replace:

((the entire two lines))

by:

The equality shows that  $F$  has positive leading term, while the inequality gives the desired degree bound.

---

**282; 12.**

Replace:

$(n)$  ((second occurrence only!!))

by:

$(i)$

---

**287; -3.**

Replace:

In fact, if

by:

If

---

**288; 2.**

Replace:

$A$

by:

$R$

---

**289; -3.**

Replace:

$x'_1 - a_1x'_e, \dots, x'_{e-1} - a_{e-1}x'_e$  ((beginning of the displayed list))

by:

$x''_1, \dots, x''_{e-1}$

---

**291; -21.**

After

a field

insert:

,  $R$  is generated by  $R_0$  over  $R_1$ ,

---

**291; -10.**

After

is a field

insert:

and  $Q_0 = 0$

---

**291; -7.**

Delete:

$Q_0 \oplus$

---

**296; -3.**

Replace:

Let

by:

If  $f$  is a unit the assertion is obvious. Otherwise, let

---

**298; 2,3.**

Replace:

$L$

by:

$L'$  ((two occurrences))

---

**301; 17.**

Replace:

Theorem 13.7

by:

Theorem 13.17

---

**303; 8,9,10.**

Replace:

$S_I$

by:

$B_I$  ((Three occurrences))

---

**303; -1.**

Before

((the period))

insert:

with equality if  $R$  is universally catenary

---

**308; 1–3.**

Replace:

((the first paragraph))

by:

We will prove Theorem 4.1 as the special case  $e = 0$  of Corollary 14.9 to the much stronger Theorem 14.8. For a direct proof see Exercise 14.1.

---

**308; after 3, as a new paragraph.**

Insert:

In general, a morphism  $\varphi : Y \rightarrow X$  of algebraic varieties is called *projective* if  $\varphi$  can be factored as  $Y \rightarrow X \times \mathbf{P}^n \rightarrow X$  with the first map a closed embedding and the second map the projection. In these geometric terms, Theorem 14.1 says that a projective morphism is *closed* in the sense that it takes closed sets onto closed sets.

---

**308; -21.**

Replace:

kernal

by:

kernel

---

**310; -3.**

Replace:

Andre

by:

André

---

**316; after line 10; just after theorem 14.8.**

Insert:

Let us restate Theorem 14.8 (or rather its consequence for reduced affine algebras over an algebraically closed field) in geometric terms: Suppose that  $R \rightarrow S$  corresponds to a morphism of varieties  $\varphi : Y \rightarrow X$ . Set  $F_e = \{x \in X \mid \dim \varphi^{-1}(x) \geq e\}$  and let  $G_e$  be the set of all points of  $y$  so that the fiber  $\varphi^{-1}(\varphi(y))$  has dimension  $\geq e$  locally at  $y$ . That is,  $G_e$  is the union of the large components of the preimages of points of  $F_e$ . Theorem 14.8 says that  $G_e$  is defined by the ideal  $I_e$  and is thus closed. If the morphism  $\varphi$  is projective then  $F_e$  is defined by  $J_e$ , and is closed as well. Note that  $F_e$  is the image of  $G_e$ , so we could deduce part b of Theorem 14.8 from part a together with Theorem 14.1—if it weren't that we will only prove Theorem 14.1 by using part b.

---

**319; 2.**

Replace:

principal

by:

principle

---

**330; -17.**

Replace:

((the boldface type))

by:

((roman type))

---

**331; 13.**

After

((end of line))

insert:

((an “end of proof” sign))

---

**332; -18.**

Replace:

with basis  $F$

by:

$F$  with basis

---

**341; 4.**

Replace:

irreducible

by:

irreducible

---

**342; -19 – -18.**

Delete:

refines the order by total degree and

---

**342; -15.**

Replace:

Equivalently, as the reader may check, a

by:

A

---

**342; -15.**

Replace:

is ((last word))

by:

may be

---

**342; -14.**

Delete:

either... same and

---

**374; 14 (first line of Exercise 15.33).**

Replace:

$x =$

by:

$X =$

---

**411; 16.**

Replace:

an algebra map

by:

a surjective algebra map

---

**417; -13.**

Replace:

Let

by:

Suppose that  $R$  contains a field of characteristic 0, and let

---

**417; -8.**

After

field

insert:

of characteristic 0

---

**430; 4.**

Replace:

$M$

by:

$M \neq 0$

---

**430; 5.**

Replace:

some  $k$

by:

some  $k < n$

---

**434; 12.**

Replace:

mapping cylinder

by:

mapping cone

---

**434; 19.**

Replace:

mapping cylinder

by:

mapping cone

---

**436; 3.**

Replace:

$x_r$

by:

$x_n$

---

**436; 3.**

Replace:

$\neq$

by:

$\neq 0$

---

**436; 4.**

Replace:

$x_r$

by:

$x_n$

---

**436; 4.**

Replace:

17.4

by:

17.14

---

**437; 8.**

Replace:

$m \otimes 1 - 1 \otimes m$

by:

$m \otimes 1 + 1 \otimes m$

---

**439; -3.**

The two arrows labeled with  $\beta$  should point downwards.

---

**439; -2.**

Replace:

$$K(x^*)$$

by:

$$K'(x^*)$$

---

**440; 5.**

Replace:

$$H_{n-k}(K(x), \delta_{x^*})$$

by:

$$H_{n-k}(K'(x^*), \delta_{x^*})$$

---

**443; -18.**

Replace:

$$S/(x_1, \dots, x_r)$$

by:

$$S/(y_1, \dots, y_r)$$

---

**444; 3.**

Replace:

$$e_j$$

by:

$$e_J$$

---

**446; 9.**

Replace:

$$3.16$$

by:

$$13.16$$

---

**448; 8.**

The  $\sigma$  should be situated on the final arrow.

---

**459; -3.**

Delete:

Let  $R$  be a Cohen-Macaulay ring.

---

**462; 13.**

Replace:

$$11.12$$

by:

$$11.10$$

---

**462; -16.**

Replace:

$$S1'$$

by:

$$S1$$

---

**466; -10.**

Replace:

$$7.17$$

by:

$$7.7$$

---

**468; 11.**

Replace:

Fulton [1992]

by:

Fulton [1993]

---

**471; 10.**

Replace:

a domain iff  $r \geq 3$

by:

a normal domain iff  $r \geq 3$

---

**471; 10.**

Delete:

normal iff  $r \geq 4$ ;

---

**473.**

Before

the first line of text ((as on p. 423))

insert:

*In this chapter all the rings considered are assumed to be Noetherian*

---

**476; 2**

Replace:

$R$ -module

by:

module over a regular local ring of dimension  $n$

---

**477; 11.**

Replace:

$PF_n$

by:

$PF_{n-1}$

---

**477; 11.**

Replace:

$i$

by:

$i \geq 0$

---

**478; -11.**

Replace:

Corollary 15.13

by:

Corollary 15.11

---

**478; -10.**

Replace:

Corollary 19.6

by:

Corollary 19.7

---

**484; -9 – -8.**

Replace:

It turns...remark.

by:

We begin with a simple observation:

---

**487; 13.**

Delete:

((the end of proof symbol at the end of the line))

---

**487; -6.**

Replace:

$R_P$

by:

$R[x^{-1}]_P$

---

**487; -1.**

Insert:

((an end of proof symbol at the end of the line))

---

**490; -18.**

Replace:

$\dim_k(M_d)$

by:

$\dim_k(M_d)t^d$

---

**492;3.**

Before

the homogeneous

insert:

which is

---

**492; -7.**

Replace:

polynomial

by:

family of polynomials  $c_t(M)$

---

**492; -4.**

Delete:

Chern and

---

**492; -5 – -1.**

Replace:

((the whole last paragraph))

by:

Knowing the Hilbert polynomial of a module  $M$  is equivalent to knowing the Chern polynomial  $c_t(M) = 1 + c_1(M)t + c_2(M)t^2 + \dots \bmod t^{n+1}$  and the rank of  $M$ . We sketch this equivalence: The Hirzebruch-Riemann-Roch formula allows one to deduce the Hilbert polynomial from the Chern classes and the rank as follows: First form the *Chern character*, which is a power series of the form  $\text{rank}(M) + c_1(M)t + \frac{1}{2}(c_1(M))^2 - 2c_2(M)t^2 + \dots \bmod t^{n+1}$ . The Hilbert polynomial  $P_M(d)$  is equal, for large  $d$ , to the coefficient of  $t^n$  in the expression

$$e^{nt} \left( \frac{t}{1 - e^{-t}} \right) ch(M).$$

See Hartshorne [1977] Appendix A4, or Fulton [1984], especially chapter 15. Conversely, to compute the Chern polynomial from the Hilbert polynomial, consider first the special case  $M = S_j := S/(x_1, \dots, x_j)$ . From the Koszul complex resolving  $M$  and properties i and ii above we see

$$c_t(S_j) = \frac{\prod_{i \text{ even}} (1 - it)^{\binom{n-j}{i}}}{\prod_{i \text{ odd}} (1 - it)^{\binom{n-j}{i}}} \text{mod } t^{n+1}.$$

Now any Hilbert polynomial can be written (uniquely) in the form  $P_M = \sum_{j \geq 0} a_j P_{S_j}$ . It follows that the Chern polynomial of  $M$  is  $c_t(M) = \sum_{j \geq 0} a_j c_t(S_j)$ . Of course the rank of  $M$  is  $a_0$ , completing the argument.

**493.**

Before

the first line of text ((as on p. 423))

insert:

*In this chapter all the rings considered are assumed to be Noetherian*

**497; -15.**

Delete:

((the end of proof symbol at the end of the line))

**497; -4.**

Replace:

$$I_j \varphi = I_{j+p} \varphi$$

by:

$$I_j \varphi = I_{j+p} \psi$$

**502; -3.**

Delete:

((the end of proof symbol at the end of the line))

**506; -14.**

After

is exact,

insert:

$F_2$  is free,

**506; -10.**

Replace:

$$I(\varphi_2)$$

by:

$$I_{n-1}(\varphi_2)$$

**510; -7.**

Replace:

$$\text{Ext}^j(M, R)_n$$

by:

$$\text{Ext}^j(M, S)_n$$

**521; -12.**

Replace:

((the entire line))

by:

$$\text{Ext}^j(M, S)_k = 0 \text{ for all } j \leq n - 1 \text{ and } k = -m - j - 1.$$

**529; 14.**

Replace:

By Proposition 9.2

by:

By hypothesis

---

**529; -19.**

Before

whose

insert:

$\varphi$

---

**530; 1.**

After

Zariski

insert:

Gorenstein rings were defined—in exactly the way done in this book!—in the artinian and graded cases by Macaulay in his last paper [1934] (his definition in the affine case differs slightly from the modern one).

---

**530; 7.**

After

attests.

insert:

There is also a well-developed noncommutative theory (Frobenius and quasi-Frobenius rings.)

---

**530; -11.**

Replace:

Proposition 21.2

by:

Corollary 21.3

---

**531; 4.**

After

$x_i$

insert:

and  $x_i^{-1}$

---

**531; 5.**

Replace:

the  $S$ -module. . .  $T$

by:

$T$  with a sub- $S$ -module of  $K(S)/L$

---

**531; 10.**

After

generated

insert:

nonzero

---

**531; -14.**

Replace:

$:=$

by:

$=$

---

**531; -10.**

After

any

insert:

nonzero finitely generated

---

**531; -2.**

After

).

insert:

(Proof: One checks by linear algebra that these elements generate the part of the annihilator in degrees  $\leq 2$ , even as a vector space. These elements generate all forms of degree  $\geq 3$ .)

---

**532; 11.**

After

$x \in A$

insert:

that is also a nonzerodivisor on  $\omega_A$

---

**532; -18.**

Replace:

21.4d

by:

21.5d

---

**533; -8.**

After

condition.

insert:

Note that  $c$  implies that the annihilator of  $W$  is 0, just as in the special case of Prop. 21.3

---

**533; -3.**

Replace:

..

by:

. ((after the Proposition number))

---

**539; 14.**

Replace:

$x$

by:

$x \in R$

---

**543; -17.**

Replace:

$M/xM$

by:

—

---

**544; 13.**

Replace:

$x_0, x_1$

by:

$x_1, x_2$

---

**544; 18.**

Replace:

Enzyklopädie

by:

Enzyklopädie

---

**547; -6.**

Replace:

$A^n$

by:

$A^{n+1}$

---

**549; -7.**

After

such that

insert:

$x$  is a nonzerodivisor on  $W$  and

---

**550; first line of Exercise 21.1**

After

$y^n$ )

insert:

,  $n \geq 2$

---

**550; -5.**

Replace:

$\omega_R$

by:

$R$

---

**551; 1.**

After

and

insert:

, with the notation introduced just after Proposition 21.5,

---

**551; first two displays.**

Replace:

$$\sum_{i_1, \dots, i_r}$$

by:

$$\sum_{i_1, \dots, i_r \geq 0}$$

((two occurrences))

---

**554; -1.**

Delete:

((this entire line))

---

**556; -7.**

Replace:

degree

by:

$\deg$  ((two occurrences))

---

**559; 6.**

Replace:

$x_1$

by:

$x_0$

---

**559; 13.**

Replace:

$\sum d_i - r$

by:

$\sum d_i - r - 1$

---

**575; 8–12 and 13–19.**

((These two paragraphs are both definitions, and should be set in italics, with a skip below the paragraph, just as with the first paragraph on this page.))

---

**581; 13.**

Before

module

insert:

of rank  $n$

---

**581; 15.**

Replace:

$\lambda^d$

by:

$\lambda^{n-d}$

---

**609; -20.**

Replace:

corollary

by:

theorem

---

**609; -7.**

Replace:

Corollary

by:

Theorem

---

**623; 10.**

Replace:

a variety

by:

an affine variety

---

**630; -17.**

Replace:

both  $E$

by:

both  $E'$

---

**630; -4.**

Replace:

b.\*

by:

b.

---

**631; 1.**

Replace:

c.

by:

c.\*

---

**645; -9.**

Delete:

$0 \rightarrow$

---

**652; -11.**

Replace:

$E^1(A, B)$

by:

$E_R^1(A, B)$

---

**652; -15.**

Replace:

$0 : 0 \rightarrow A \rightarrow A \oplus B \rightarrow B \rightarrow 0$

by:

$0 : 0 \rightarrow B \rightarrow A \oplus B \rightarrow A \rightarrow 0$

---

**653; 10.**

Replace:

$A$ .

by:

$B$ .

---

**654; -9.**

Replace:

$A, B$

by:

$B, A$

---

**654; -7.**

Replace:

$A, B$

by:

$B, A$

---

**654; -6.**

Replace:

$A, B$

by:

$B, A$

---

**654; -6.**

Replace:

an injective

by:

a projective

---

**654; -5.**

Replace:

a projective

by:

an injective

---

**655; 5.**

Replace:

$A$

by:

$C$

---

**655; 7.**

Replace:

$C$

by:

$A$

---

**655; 10.**

Replace:

$C$

by:

$A$

---

**655; 10.**

Replace:

$A$

by:

$C$

---

**661; -7.**

Replace:

$F \rightarrow G$

by:

$G \rightarrow F$

---

**669; 3,4.**

Replace:

$F$

by:

$A$  ((three occurrences))

---

**669; 5.**

Delete:

$\bar{F}$

---

**669; 8.**

Replace:

$F$

by:

$A$

---

**669; 10.**

Replace:

$F$

by:

$A$  ((two occurrences))

---

**671; -3.**

Replace:

We consider

by:

Let  $A = \bigoplus_{p \in \mathbf{Z}} G^p$ , and let  $\alpha : A \rightarrow A$  be the map defined by the inclusions  $G^{p+1} \subset G^p$ . We consider

---

**671; -2.**

Replace:

$H(G)$

by:

$H(A)$

---

**671; -2.**

Replace:

$H(G/\alpha G)$

by:

$H(A/\alpha A)$

---

**672; Figure A3.29.**

Replace:

$G$

by:

$A$  ((four occurrences))

---

**672; -9.**

Replace:

horizontal

by:

vertical

---

**674; 9.**

After

$G^q)^p$

insert:

$= \bigoplus_{i+j=q, j \geq p} F^{i,j}$

---

**674; 10.**

After

then in

insert:

$$(G^{q+1})^{p+r}$$

---

**674; 11.**

((delete the display, and close up))

---

**688; 11.**

Replace:

$$G \circ P \rightarrow LF \circ P \rightarrow F$$

by:

$$G \circ P \rightarrow LF \circ P \rightarrow P \circ KF$$

---

**694; -10.**

Replace:

$R$ -module

by:

$S$ -module

---

**694; -9.**

Replace:

$R$

by:

$S$

---

**694; -8.** Replace two occurrences of  $R$  by  $S$ . That is,

Replace:

$$\text{Hom}_R(-, -, E(R/P))$$

by:

$$\text{Hom}_S(-, -, E(S/P))$$

---

**697; 5.**

Replace:

collections

by:

collection

---

**728; -9.**

Delete:

(by Lemma 3.3)

---

**728; -9.**

Replace:

$\in R_i$

by:

$\in R$

---

**743; 16.**

Replace:

b.

by:

c.

---

---

**746; 13–17.**

Replace:

((the complete text of the hint for Exercise 20.20 by))

by:

It follows from local duality that if  $S = k[x_0, \dots, x_n]$  is the homogeneous coordinate ring of  $\mathbf{P}^n$ , then

$$H^j(\mathbf{P}^n; \mathcal{F}(m-j))^\vee \cong \text{Ext}^{n-j}(M, S)_{-n-1-(m-j)}$$

for all  $j$ . This gives a. If  $M$  has depth  $\geq 2$  we have  $\text{Ext}^{n-j}(M, S) = 0$  for  $j \leq 0$  and statement b becomes a direct translation of Proposition 20.16 and Theorem 20.17.

---

**746; -1.**

((The dots in the right part of the diagram should run from SE to NW and should connect the two pieces of this part of the diagram, in analogy with what happens in the left part of the diagram.))

---

**747; 15.**

Replace:

Theorem 18.4

by:

Proposition 18.4

---

**747; 18.**

Replace:

((The displayed sequence))

by:

$$0 \rightarrow \text{Ext}_R^d(M'', R) \rightarrow \text{Ext}_R^d(M, R) \rightarrow \text{Ext}_R^d(M', R) \rightarrow 0$$

---

**751; -19.**

Replace:

b.

by:

c.

---

**751; -14 – -11.**

Replace:

For this value...  $Q$  is injective ((three sentences))

by:

The map  $\alpha$  thus factors through the projection  $I \rightarrow I/P^d I$ , so by Artin-Rees it factors through the projection  $I \rightarrow I/(P^e \cap I) \subset R/P^e$  for large  $e$ . Since  $Q^{(e)}$  is injective over  $R/P^e$ , we can extend this to a map  $R/P^e \rightarrow Q^{(e)}$ , and thus to a map  $R \rightarrow Q$ , proving that  $Q$  is injective.

---

**758; 5.**

Replace:

Théoremes

by:

Théorèmes

---

**758; -19 – -18.**

Replace:

((italics))

by:

((roman))

**758; -18.**

Replace:

Preprint.

by:

Inst. Hautes Études Sci. Publ. Math. 86 (1997) 67–114.

---

**759; 9–13.**

Replace:

entire reference

by:

Bayer, D., and M. Stillman (1982-1990) Macaulay: A system for computation in algebraic geometry and commutative algebra. Source and object code available for many computer platforms. See <http://www.math.uiuc.edu/Macaulay2/> for a pointer to this and to the successor program Macaulay2 by D. Grayson and M. Stillman.

---

**759; 22.**

Replace:

*Algèbre*

by:

*Algèbre*

---

**759; 28.**

Replace:

Algèbre

by:

*Algèbre*

---

**759; -15.**

Insert:

93 (1994) 211–229. ((at end of line))

---

**760; 6.**

Insert:

((as new reference)) Buchsbaum, D. A. (1969). Lectures on regular local rings. In *Category theory, homology theory and their applications, I*. Battelle Inst. Conf., Seattle, Washington., 1968, Vol. 1, 13–22. Springer Lect. Notes in Math. 86

---

**760; -8.**

Replace:

1944

by:

1943

---

**761; -9.**

Replace:

Schopf

by:

Schöpf

---

**762; 6.**

Replace:

in the

by:

is the

---

**762; -13 – -12.**

Replace:

(in press).

by:

Duke Math. J. 84 (1995) 1–45.

---

**763; -18 – -14.**

Replace:

the whole Gelfand-Manin reference

by:

Gelfand, S. and Y. I. Manin (1989–1996). *Methods of homological algebra*. Springer-Verlag, Berlin, 1996. English translation of the 1989 Russian original.

---

**764; 24.**

Replace:

Les foncteurs ... continu ((the whole title))

by:

Catégories dérivées et foncteurs dérivés

---

**764; -14.**

Replace:

point

by:

points

---

**766; 1.**

Replace:

Der Frage

by:

Die Frage

---

**766; 15.**

Replace:

((boldface type))

by:

((roman))

---

**767; -15.**

Replace:

Time

by:

Times

---

**767; -12.**

Replace:

van

by:

von

---

**768; 11.**

Replace:

Birkhauser

by:

Birkhäuser

---

**769 Insert as a new referece.**

Insert:

Macaulay, F.S. Modern algebra and polynomial ideals, *Proc. Cam. Phil. Soc.* 30, pp. 27–64.

---

**770; -14.**

Replace:

van

by:

von

---

**770; -12**

Replace:

in press

by:

1996

---

**771; 7.**

Replace:

Rabinowitch

by:

Rabinowitsch

---

**772; -12.**

Replace:

Bemerking

by:

Bemerkung

---

**772; -12.**

Replace:

van

by:

von

---

**773; -18.**

Replace:

Über

by:

Über

---

**773; -16.**

Replace:

Bezout

by:

Bézout

---

**773; -2.**

Replace:

*Its*

by:

*its*

---

**774; 4.**

Replace:

1994

by:

1995

---

**774; 5.**

Replace:

(preprint)

by:

J. Algebraic Combin. 4 (1995) 253–269.

---

**775; -16 – -15, second column.**

Insert:

$\kappa(P)$ , residue field, 60

---

**776; -0, second column.**

Insert:

$E(M)$ , injective envelope, 628

---

**785; 20, second column.**

Replace:

18

by:

17

---

**789; 10, second column.**

Replace:

Kozul

by:

Koszul

---

**790; 8 of second column.**

After

M-sequence,

insert:

243,248,423ff,

---

**793; -17 of first column.**

Replace:

167

by:

308,316

---