CLOSED MAXIMAL IDEALS IN SOME FRÉCHET ALGEBRAS OF HOLOMORPHIC FUNCTIONS

ROMEO MESTROVIĆ

Abstract. The space $F^p$ ($1 < p < \infty$) consists of all holomorphic functions $f$ on the open unit disk $D$ such that \[ \lim_{r \to 1} (1 - r)^{1/q} \log^+ M_\infty(r, f) = 0, \] where $M_\infty(r, f) = \max_{|z| \leq r} |f(z)|$ with $0 < r < 1$. Stoll [5, Theorem 3.2] proved that the space $F^p$ with the topology given by the family of seminorms \( \{\| \cdot \|_{q,c}\}_{c>0} \) defined for $f \in F^q$ as \( \|f\|_{q,c} = \sum_{n=0}^{\infty} |a_n| \exp\left( -cn^{1/(q+1)} \right) \) becomes a countably normed Fréchet algebra. It is known that for every $p > 1$, $F^p$ is the Fréchet envelope of the Privalov space $N^p$.

In this paper, we extend our study of [32] on the structure of maximal ideals in the algebras $F^p$ ($1 < p < \infty$). Namely, the obtained characterization of closed maximal ideals in $F^p$ from [32] is extended here in terms of topology of uniform convergence on compact subsets of $D$.

1. Introduction, Preliminaries and Results

Let $D$ denote the open unit disk in the complex plane and let $T$ denote the boundary of $D$. Let $L^q(T)$ ($0 < q \leq \infty$) be the familiar Lebesgue space on the unit circle $T$.

The Privalov class $N^p$ ($1 < p < \infty$) is defined as the set of all holomorphic functions $f$ on $D$ such that
\[
\sup_{0 < r < 1} \int_0^{2\pi} (\log^+ |f(re^{i\theta})|)^p \frac{d\theta}{2\pi} < +\infty
\]
holds, where $\log^+ |a| = \max\{\log |a|, 0\}$. These classes were firstly considered by Privalov in [1], pages 93–101, where $N^p$ is denoted as $A_q$.

Recall the condition (1) with $p = 1$ defines the Nevanlinna class $N$ of holomorphic functions in $D$. The Smirnov class $N^+$ is the set of all functions $f$ holomorphic on $D$ such that
\[
\lim_{r \to 1} \int_0^{2\pi} \log^+ |f(re^{i\theta})| \frac{d\theta}{2\pi} = \int_0^{2\pi} \log^+ |f^*(e^{i\theta})| \frac{d\theta}{2\pi} < +\infty,
\]
where $f^*$ is the boundary function of $f$ on $T$, i.e.,
\[
f^*(e^{i\theta}) = \lim_{r \to 1} f(re^{i\theta})
\]
is the radial limit of a function $f$ which exists for almost every $e^{i\theta} \in T$. We denote by $H^q$ ($0 < q \leq \infty$) the classical Hardy space on $D$.

The following inclusion relations hold true (see [2, 3, 4]):
\[
N^r \subset N^p \quad (r > p), \quad \bigcup_{q>0} H^q \subset \bigcap_{p>1} N^p, \quad \text{and} \quad \bigcup_{p>1} N^p \subset N^+ \subset N,
\]
where the all containment relations are proper.

Mathematics Subject Classification (2010). 30H05, 46J15, 46J20.
The study of the spaces $N^p (1 < p < \infty)$ was continued in 1977 by M. Stoll \[5\] (with the notation $(\log^+ H)^{\alpha}$ in \[5\]). Further, the topological and functional properties of these spaces have been extensively studied by several authors (see \[2,6,7,8\] and \[9–23\]).

M. Stoll \[5, Theorem 4.2\] showed that for every $p > 1$ the space $N^p$ (with the notation $(\log^+ H)^{\alpha}$ in \[5\]) equipped with the topology given by the metric $d_p$ defined by

$$d_p(f, g) = \left( \int_0^{2\pi} (\log(1 + |f^*(e^{i\theta}) - g^*(e^{i\theta})|))^p \frac{d\theta}{2\pi} \right)^{1/p}, \quad f, g \in N^p,$$

becomes an $F$-algebra. This means that $N^p$ is an $F$-space (a complete metrizable topological vector space with the invariant metric) in which multiplication is continuous.

Observe that the function $d_1 = d$ defined on the Smirnov class $N^+$ by (5) with $p = 1$ induces the metric topology on $N^+$. N. Yanagihara \[24\] proved that under this topology, $N^+$ is an $F$-space.

In connection with the spaces $N^p (1 < p < \infty)$, Stoll \[5\] (see also \[6\] and \[18, Section 3\]) also studied the spaces $F^q (0 < q < \infty)$ (with the notation $F^{1/q}$ in \[5\]), consisting of those functions $f$ holomorphic on $D$ such that

$$\lim_{r \to 1} (1 - r)^{1/q} \log^+ M_\infty(r, f) = 0,$$

where

$$M_\infty(r, f) = \max_{|z| \leq r} |f(z)| \quad (0 < r < 1).$$

In this paper, we will need some Stoll’s results concerning the spaces $F^q$ only with $1 < q < \infty$. Accordingly, in the sequel, we will assume that $q = p > 1$ be a fixed real number.

**Theorem 1** (see \[5, Theorem 2.2\]). Suppose that $f(z) = \sum_{n=0}^{\infty} a_n z^n$ is a holomorphic function on $D$. Then the following statements are equivalent:

(a) $f \in F^p$.

(b) there exists a sequence $\{c_n\}_n$ of positive real numbers with $c_n \to 0$ such that

$$|a_n| \leq \exp\left(c_n n^{1/(p+1)}\right), \quad n = 0, 1, 2, \ldots;$$

(c) for any $c > 0$,

$$\|f\|_{p,c} := \sum_{n=0}^{\infty} |a_n| \exp\left(-cn^{1/(p+1)}\right) < \infty.$$

**Remark.** Note that in view of the equivalence (a)$\iff$(c) of Theorem 1, by (9) it is well defined the family of seminorms $\{\| \cdot \|_{p,c}\}_{c>0}$ on $F^p$.

Recall that a locally convex $F$-space is called a Fréchet space, and a Fréchet algebra is a Fréchet space that is an algebra in which multiplication is continuous. Stoll \[5\] also proved the following result.

**Theorem 2** (see \[5, Theorem 3.2\]). The space $F^q (0 < q < \infty)$ equipped with the topology given by the family of seminorms $\{\| \cdot \|_{q,c}\}_{c>0}$ defined for $f \in F^q$ as

$$\|f\|_{q,c} := \sum_{n=0}^{\infty} |a_n| \exp\left(-cn^{1/(q+1)}\right) < \infty,$$

is a countably normed Fréchet algebra.
Moreover, Stoll [5] defined the family of seminorms \( \{ \| \cdot \|_{p,c} \}_{c>0} \) on \( F^p \) given as
\[
\| f \|_{p,c} = \int_0^1 \exp \left( -c(1-r)^{-1/p} \right) M_p(r,f) \, dr, \quad f \in F^p,
\]
where
\[
M_p(r,f) = \left( \int_0^{2\pi} |f(re^{i\theta})|^p \frac{d\theta}{2\pi} \right)^{1/p}.
\]

For our purposes, we will also need the following result.

**Theorem 3** (see [5] Proposition 3.1). For each \( c > 0 \), there is a constant \( A \) depending only on \( p \) and \( c \), such that
\[
\| f \|_{p,c} \leq \| f \|_{p,c_1} \quad \text{and} \quad \| f \|_{p,c} \leq A \| f \|_{p,c_2},
\]
with \( c_1 = c^{p/(p+1)} \) and \( c_2 = (c/12)^{p/(p+1)} \).

Consequently, \( \{ \| \cdot \|_{p,c} \}_{c>0} \) and \( \{ \| \cdot \|_{p,c} \}_{c>0} \) are equivalent families of seminorms.

It is known that the Privalov space \( N^p (1 < p < \infty) \) is not locally convex (see [6] Theorem 4.2 and [14] Corollary), and thus, \( N^p \) is properly contained in \( F^p \). Furthermore, \( N^p \) is not locally bounded space (see [19] Theorem 1.1). Moreover, Stoll proved ([5] Theorem 4.3) that for every \( p > 1 \), \( N^p \) is a dense subspace of \( F^p \) and the topology on \( F^p \) equipped by the family of seminorms defined by (10) is weaker than the topology on \( N^p \) induced by the metric \( d_p \) defined by (5). Recall that Eoff proved [6] Theorem 4.2, the case \( p > 1 \) that the space \( F^p \) is the Fréchet envelope of \( N^p \). For more information on the notion of Fréchet envelope, see [25] Theorem 1], [22 Section 1] and [29] Corollary 22.3, p. 210.

**Remark.** For \( p = 1 \), the space \( F_1 \) has been denoted by \( F^+ \) and has been studied by N. Yanagihara in [27, 24]. It was proved in [27, 24] that \( F^+ \) is actually the containing Fréchet space for \( N^+ \), i.e., \( N^+ \) with the initial topology embeds densely into \( F^+ \), under the natural inclusion, and \( F^+ \) and the Smirnov class \( N^+ \) have the same topological duals.

Note that the space \( F^p \) topologised by the family of seminorms \( \{ \| \cdot \|_{p,c} \}_{c>0} \) given by (10) is metrizable by the metric \( \lambda_p \) defined as \( \lambda_p(f,g) = \sum_{n=1}^{\infty} 2^{-n} \frac{\| f-g \|_{p,1/n^{p/(p+1)}}}{1+\| f-g \|_{p,1/n^{p/(p+1)}}} \) with \( f, g \in F^p \).

Since Privalov space \( N^p \) and its Fréchet envelope \( F^p (1 < p < \infty) \) are algebras, they can be also considered as rings with respect to the usual ring’s operations addition and multiplication. Note that these two operations are continuous on the spaces \( N^p \) and \( F^p \) in view of the facts that the spaces \( N^p \) and \( F^p \) are \( F \)-algebras.

Motivated by numerous results concerning the ideal structure of some spaces of holomorphic functions given in [28, 2, 12] and [29, 30], related investigations on the spaces \( N^p (1 < p < \infty) \) and their Fréchet envelopes were given in [21, 9, 12, 37, 18, 23] and [38]. Notice that a survey of these results was given in [39]. The \( N^p \)-analogue of the famous Beurling’s theorem for the Hardy spaces \( H^q (0 < q < \infty) \) was formulated and proved in [37]. Moreover, it was showed in [9] Theorem B] that \( N^p (1 < p < \infty) \) is a ring of Nevanlinna–Smirnov type in the sense of Mortini [36]. The structure of closed weakly dense ideals in \( N^p \) was described in [18]. The ideal structure of \( N^p \) and the multiplicative linear functionals on \( N^p \) were studied in [2] and [23 Theorem ]. These results are similar to those obtained by Roberts and Stoll [30] for the Smirnov class \( N^+ \).

Motivated by results of Roberts and Stoll given in [31] Section 2 concerning a characterization of multiplicative linear functionals on \( F^+ \) and closed maximal ideals in \( F^+ \), in [32] the author of this paper proved the analogous results for the spaces \( F^p (1 < p < \infty) \).
These results are given by Proposition 5, Proposition 6, Theorem 7 and Theorem 8 in [32]. Namely, if \( \lambda \in \mathbb{D} \) and \( \gamma \lambda \) is a functional on \( F^p \) defined as

\[
\gamma \lambda (f) = f(\lambda) \tag{14}
\]

for every \( f \in F^p \), then by [32] Proposition 5, \( \gamma \lambda \) is a continuous multiplicative linear functional on \( F^p \). Furthermore, if for any fixed \( \lambda \in \mathbb{D} \) we define a set \( M_\lambda \) as

\[
M_\lambda = \{ f \in F^p : f(\lambda) = 0 \}, \tag{15}
\]

then by [32] Proposition 6, \( M_\lambda \) is a closed maximal ideal in \( F^p \). Moreover, if \( \gamma \) is a nontrivial multiplicative linear functional on \( F^p \), it is showed in [32] Theorem 7 that there exists \( \lambda \in \mathbb{D} \) such that

\[
\gamma (f) = f(\lambda) \tag{16}
\]

for every \( f \in F^p \), and in addition, \( \gamma \) is a continuous map. Finally, it is proved in [32] Theorem 8 that every closed maximal ideal in \( F^p \) is of the form \( M_\lambda \) for some \( \lambda \in \mathbb{D} \).

Motivated by a result of Igusa [40], here we extend Theorem 8 in [32] by the following result.

**Theorem 4.** Let \( p > 1 \) and let \( \mathcal{M} \) be a maximal ideal in \( F^p \). Then the following statements about \( \mathcal{M} \) are equivalent:

(i) The set \( \mathcal{M} \) is closed with respect to the topology of uniform convergence on compact subsets of \( \mathbb{D} \);

(ii) \( F^p / \mathcal{M} \cong \mathbb{C} \);

(iii) There exists \( \lambda \in \mathbb{D} \) such that \( \mathcal{M} = M_\lambda \);

(iv) \( \mathcal{M} \) is a closed ideal in \( F^p \) with respect to the topology induced on \( F^p \) by the family of seminorms \( \{ \| \cdot \|_{p,c} \}_{c > 0} \) defined by (9) and

(v) \( \mathcal{M} \) is a closed ideal in \( F^p \) with respect to the topology induced on \( F^p \) by the family of seminorms \( \{ \| \cdot \|_{p,c} \}_{c > 0} \) defined by (11).

2. Proof of Theorem 4

In order to obtain a characterization of a maximal ideal space of the algebra \( F^p \) with respect to the topology of uniform convergence on compact subsets of \( \mathbb{D} \), we will need a result of Yanagihara [11] Lemma 10 concerning the topological algebras described below.

Let \( A \) be a topological algebra over the field \( \mathbb{C} \) with identity 1, locally convex and commutative. The topology of \( A \) is defined by a countable family of seminorms \( \{ \| \cdot \|_\alpha \}_{\alpha \in S} \) (\( S = \mathbb{N} \) or \( S \) is a finite subset of the set of positive integers \( \mathbb{N} \)) for which \( \|1\|_\alpha = 1 \) and for \( a, b \in A \) there holds

\[
\|ab\|_\alpha \leq \|a\|_\alpha \cdot \|b\|_\alpha \quad \text{for all } a, b \in A, \ \alpha \in S. \tag{17}
\]

For an \( \alpha \in S \) let \( E_\alpha = \{ a \in A : \|a\|_\alpha = 0 \} \). \( E_\alpha \) is obviously an ideal of the algebra \( A \). For any \( a \in A \) we define the coset \( \bar{a} \) as \( \bar{a} = a + E_\alpha \in A / E_\alpha \). The quotient space \( A / E_\alpha \) is a normed space with the associated norm \( \|\bar{a}\|_\alpha = \|a\|_\alpha, \ \alpha \in S \). By (17) we have

\[
\|\bar{a}\|_\alpha \leq \|\bar{a}\|_\alpha \cdot \|\bar{b}\|_\alpha \quad \text{for all } \bar{a}, \bar{b} \in A / E_\alpha, \ \alpha \in S. \tag{18}
\]

The completion of the space \( A / E_\alpha \) with respect to the norm \( \| \cdot \|_\alpha \) is denoted by \( A^*_\alpha \). Then we have the following result.

**Lemma 5.** ([11] Lemma 10). Let \( A \) be a topological algebra described above. Then for any \( f \in A \) there exists a complex number \( \lambda_f \) depending on \( f \) such that \( \lambda_f - f = (\lambda_f 1 - f) \) is not invertible element of the algebra \( A \).

**Proof of Theorem 4.** (i)\(\Rightarrow\)(ii). Obviously, there holds \( F^p / M \cong \mathbb{C} \). For \( f \in F^p \) denote

\[
[f] = f + M \in F^p / M. \tag{19}
\]
Now we define the family of seminorms \( \{ \| \cdot \|_r \} \) \( 0 \leq r < 1 \) in \( F^p/\mathcal{M} \) as follows:

\[
\| [f] \|_r = \inf_{h \in \mathcal{M}} \{ \max_{|z|=r} |f(z) + h(z)| \}, \quad 0 \leq r < 1.
\] (20)

Then obviously, we have

\[
\| [fg] \|_r \leq \| [f] \|_r \cdot \| [g] \|_r, \quad 0 \leq r < 1.
\] (21)

By Lemma 5, to each \( [f] \in F^p/\mathcal{M} \) corresponds a number \( \lambda \in \mathbb{C} \) such that \( \lambda - [f] \) is not invertible element of \( F^p/\mathcal{M} \). However, by the maximality of the ideal \( \mathcal{M} \), we conclude that \( F^p/\mathcal{M} \) is a field, and thus, \( \lambda - f \) must belong to \( \mathcal{M} \), i.e., \( \lambda \in [f] \). Hence, we obtain (cf. [32, Proof of Theorem 8] with application of Arens’ result [42])

\[
F^p/\mathcal{M} \cong \mathbb{C}.
\] (22)

(ii) \( \Rightarrow \) (iii). Let \( \lambda \) be in the coset \( [z] \in F^p/\mathcal{M} \). Then \( z - \lambda \in \mathcal{M} \), and hence, \( \lambda \in \mathbb{D} \).

For each \( f \in F^p \) we have

\[
f(z) - f(\lambda) = A(z)(z - \lambda).
\] (23)

It is easy to see that \( A(z) \in F^p \), and thus, \( f(z) - f(\lambda) \in \mathcal{M} \). Therefore, if \( f(z) \in \mathcal{M} \), then \( f(\lambda) \in \mathcal{M} \), whence it follows that \( f(\lambda) = 0 \). This shows that \( \mathcal{M} = M_\lambda \).

(iii) \( \Rightarrow \) (i). This implication is evident from the theorem of Hurwitz.

(iv) \( \Rightarrow \) (iii). This implication immediately follows from [32, Proposition 6].

(iv) \( \Leftrightarrow \) (v). This equivalence immediately follows from [32, Theorem 8].

References

[1] I. I. Privalov, Boundary Properties of Analytic Functions, Izdat. Moskovskogo Universiteta, Moscow, Russia, 1941.
[2] N. Mochizuki, “Algebras of holomorphic functions between \( H^p \) and \( N_\alpha \),” Proceedings of the American Mathematical Society, vol. 105, pp. 898–902, 1989.
[3] R. Meštrović and Ž. Pavičević, “Remarks on some classes of holomorphic functions,” Mathematica Montisnigri, vol. 6, pp. 27–37, 1996.
[4] Y. Iida, “Bounded subsets of classes \( M^p(X) \) of holomorphic functions,” Journal of Function Spaces, vol. 2017, Article ID 7260602, 4 pages, 2017.
[5] M. Stoll, “Mean growth and Taylor coefficients of some topological algebras of analytic functions,” Annales Polonici Mathematici, vol. 35, no. 2, pp. 139–158, 1977.
[6] C. M. Eoff, “Fréchet envelopes of certain algebras of analytic functions,” Michigan Mathematical Journal, vol. 35, pp. 413–426, 1988.
[7] C. M. Eoff, “A representation of \( N_\alpha^p \) as a union of weighted Hardy spaces,” Complex Variables, Theory and Application, vol. 23, pp. 189–199, 1993.
[8] Y. Iida and N. Mochizuki, “Isometries of some \( F \)-algebras of holomorphic functions,” Archiv der Mathematik, vol. 71, no. 4, pp. 297–300, 1998.
[9] R. Meštrović, “Ideals in some rings of Nevanlinna-Smirnov type,” Mathematica Montisnigri, vol. 8, pp. 127–135, 1997.
[10] R. Meštrović, Topological and \( F \)-algebras of holomorphic functions [Ph.D. Thesis], University of Montenegro, Podgorica, Montenegro, 1999.
[11] R. Meštrović and A. V. Subbotin, “Multipliers and linear functionals for Privalov spaces of holomorphic functions in the disc,” Doklady Akademii Nauk, vol. 365, no. 4, pp. 452–454, 1999 (Russian).
[12] Y. Matsugu, “Invariant subspaces of the Privalov spaces,” Far East Journal of Mathematical Sciences, vol. 2, no. 4, pp. 633–643, 2000.
[13] B. R. Choe and H. O. Kim, “Composition operators between Nevanlinna-type spaces,” Journal of Mathematical Analysis and Applications, vol. 257, pp. 378–402, 2001.
[14] R. Meštrović, “The failure of the Hahn-Banach properties in Privalov spaces of holomorphic functions,” Mathematica Montisnigri, vol. 17, pp. 27–36, 2004.
[15] A. K. Sharam and S.-I. Ueki, “Composition operators from Nevanlinna type spaces to Bloch type spaces,” Banach Journal of Mathematical Analysis, vol. 6, no. 1, pp. 112–123, 2012.
[16] R. Meštrović, “On $F$-algebras $M^p (1 < p < \infty)$ of holomorphic functions,” The Scientific World Journal, vol. 2014, Article ID 901726, 10 pages, 2014.

[17] R. Meštrović and Z. Pavičević, “Topologies on some subclasses of the Smirnov class,” Acta Scientiarum Mathematicarum, vol. 69, pp. 99–108, 2003.

[18] R. Meštrović and Z. Pavičević, “Weakly dense ideals in Privalov spaces of holomorphic functions,” Journal of the Korean Mathematical Society, vol. 48, no. 2, pp. 397–420, 2011.

[19] R. Meštrović and Z. Pavičević, “A topological property of Privalov spaces on the unit disk,” Mathematica Montisnigri, vol. 31, pp. 5–15, 2014.

[20] R. Meštrović and J. Sušić, “Interpolation in the spaces $N^p (1 < p < \infty)$,” Filomat, vol. 27, pp. 293–301, 2013.

[21] R. Meštrović, “On $F$-algebras $M^p (1 < p < \infty)$ of holomorphic functions,” The Scientific World Journal, vol. 2014, Article ID 901726, 10 pages, 2014.

[22] R. Meštrović, “Topological and functional properties of some $F$-algebras of holomorphic functions,” Journal of Function Spaces, vol. 2015, Article ID 850709, 6 pages, 2015.

[23] R. Meštrović, “Maximal ideals in some $F$-algebras of holomorphic functions,” Filomat, vol. 29, pp. 1–5, 2015.

[24] N. Yanagihara, “Multipliers and linear functionals for the class $N^+$,” Transactions of the American Mathematical Society, vol. 180, pp. 449–461, 1973.

[25] J. H. Shapiro, “Mackey topologies, reproducing kernels, and diagonal maps on Hardy and Bergman spaces,” Duke Mathematical Journal, vol. 40, pp. 187–202, 1976.

[26] J. E. Kelley, I. Namioka et al., Linear topological spaces, Princeton, 1963.

[27] N. Yanagihara, “The containing Fréchet space for the class $N^+$,” Duke Mathematical Journal, vol. 40, no. 1, pp. 93–103, 1973.

[28] H. O. Kim, “On closed maximal ideals of $M$,” Proceedings of the Japan Academy A, vol. 62, pp. 343–346, 1986.

[29] A. Beurling, “On two problems concerning linear transformations in Hilbert space,” Acta Mathematica, vol. 81, pp. 239–255, 1949.

[30] J. W. Roberts and M. Stoll, “Prime and principal ideals in the algebra $N^+$,” Archiv der Mathematik (Basel), vol. 27, no. 4, pp. 387–393, 1976; Correction, vol. 30, no. 1, p. 672, 1978.

[31] J. W. Roberts and M. Stoll, “Composition operators on $F^+$,” Studia Mathematica, vol. 57, pp. 217–228, 1976.

[32] R. Meštrović, “A characterization of maximal ideals in the Fréchet algebras of holomorphic functions $F^p (1 < p < \infty)$,” preprint [arXiv:1812.11091 [math.NT]], 2018.

[33] M. Stoll, “A characterization of $F^+ \cap N$,” Proceedings of the American Mathematical Society, vol. 57, no. 1, pp. 97–98, 1976.

[34] W. S. McVoy and L. A. Rubel, “Coherence of some rings of functions,” Journal of Functional Analysis, vol. 21, pp. 76–87, 1976.

[35] M. von Renteln, “Ideals in the Nevanlinna class $N$,” Mitteilungen aus dem Mathematischen Seminar Giessen, vol. 123, pp. 57–65, 1977.

[36] R. Mortini, Zur Idealstruktur von Unterringen der Nevanlinna-klasse $N$, Séminaire de Mathématique de Luxembourg, vol. 1, pp. 81–91, 1989.

[37] R. Meštrović and Z. Pavičević, “The logarithmic analogue of Szegő’s theorem,” Acta Scientiarum Mathematicarum, vol. 64, pp. 97–102, 1998.

[38] R. Meštrović, “A characterization of some prime ideals in certain $F$-algebras of holomorphic functions,” preprint [arXiv:1902.09616 [math.CV]], 2019.

[39] R. Meštrović and Z. Pavičević, “A short survey of the ideal structure of Privalov spaces on the unit disk,” Mathematica Montisnigri, vol. 32, pp. 14–22, 2015.

[40] J. Igusa, “On a property of the domain of regularity,” Memoirs of the College Science, University of Kyoto, Ser. A, vol. 27, no. 2, pp. 95–97, 1952.

[41] N. Yanagihara, “Generators and maximal ideals in some algebras of holomorphic functions,” Tohoku Mathematical Journal, vol. 27, pp. 31–47, 1975.

[42] R. Arens, “Linear topological division algebras,” Bulletin of the American Mathematical Society, vol. 53, pp. 629–630, 1947.

University of Montenegro, Maritime Faculty Kotor, Dobrota 36, 85330 Kotor, Montenegro, e-mail: romeo@ucg.ac.me