

[Title Page](#)

[Contents](#)

[◀◀](#) [▶▶](#)

[◀](#) [▶](#)

Page 1 of 14

[Go Back](#)

[Full Screen](#)

[Close](#)

UNIFORMLY STARLIKE AND UNIFORMLY CONVEX FUNCTIONS PERTAINING TO SPECIAL FUNCTIONS

V.B.L. CHAURASIA

Department of Mathematics
University of Rajasthan
Jaipur-302004, India

AMBER SRIVASTAVA

Department of Mathematics
Swami Keshvanand Institute of Technology,
Management and Gramothan
Jagatpura, Jaipur-302025, India
EMail: amber@skit.ac.in

Received: 04 September, 2006

Accepted: 14 July, 2007

Communicated by: **H.M. Srivastava**

2000 AMS Sub. Class.: 30C45.

Key words: Analytic functions, Univalent functions, Starlike functions, Convex functions, Integral operator, Fox-Wright function.

Abstract: The main object of this paper is to derive the sufficient conditions for the function $z\{p\psi_q(z)\}$ to be in the classes of uniformly starlike and uniformly convex functions. Similar results using integral operator are also obtained.

Acknowledgements: The authors are grateful to Professor H.M. Srivastava, University of Victoria, Canada for his kind help and valuable suggestions in the preparation of this paper.

Contents

1	Introduction	3
2	Main Results	5
3	An Integral Operator	9
4	Particular Cases	12



**Uniformly Starlike and
Uniformly Convex Functions**

V.B.L. Chaurasia and
Amber Srivastava

vol. 9, iss. 1, art. 30, 2008

Title Page

Contents



Page 2 of 14

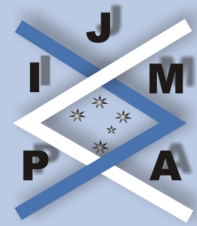
Go Back

Full Screen

Close

journal of **inequalities**
in pure and applied
mathematics

issn: 1443-5756



1. Introduction

Let A denote the class of functions of the form

$$(1.1) \quad f(z) = z + \sum_{n=2}^{\infty} a_n z^n,$$

that are analytic in the open unit disk $\Delta = \{z : |z| < 1\}$.

Also let S denote the subclass of A consisting of all functions $f(z)$ of the form

$$(1.2) \quad f(z) = z - \sum_{n=2}^{\infty} a_n z^n, \quad a_n \geq 0.$$

A function $f \in A$ is said to be starlike of order α , $0 \leq \alpha < 1$, if and only if $\operatorname{Re} \left(\frac{zf'(z)}{f(z)} \right) > \alpha$, $z \in \Delta$. Also f of the form (1.1) is uniformly starlike, whenever $\left(\frac{f(z)-f(\xi)}{(z-\xi)f'(z)} \right) \geq 0$, $(z, \xi) \in \Delta \times \Delta$. This class of all uniformly starlike functions is denoted by UST [4] (see also [5], [10] and [14]).

The function f of the form (1.1) is uniformly convex in Δ whenever

$$\operatorname{Re} \left(1 + (z - \xi) \frac{f''(z)}{f'(z)} \right) \geq 0, \quad (z, \xi) \in \Delta \times \Delta.$$

This class of all uniformly convex functions is denoted by UCV [3] (also refer [2], [6], [9] and [13]). Further it is said to be in the class $UCV(\alpha)$, $\alpha \geq 0$ if $\operatorname{Re} \left(1 + \frac{zf'(z)}{f(z)} \right) \geq \alpha \left| \frac{zf''(z)}{f'(z)} \right|$.

A function f of the form (1.2) is said to be in the class $USTN(\alpha)$, $0 \leq \alpha \leq 1$, if $\operatorname{Re} \left(\frac{f(z)-f(\xi)}{(z-\xi)f'(z)} \right) \geq \alpha$, $(z, \xi) \in \Delta \times \Delta$.

[Title Page](#)

[Contents](#)

[◀◀](#) [▶▶](#)

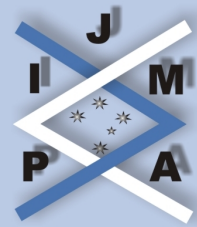
[◀](#) [▶](#)

Page 3 of 14

[Go Back](#)

[Full Screen](#)

[Close](#)



Title Page

Contents

◀◀ ▶▶

◀ ▶

Page 4 of 14

Go Back

Full Screen

Close

In the present paper, we shall use analogues of the lemmas in [8] and [7] respectively in the following form.

Lemma 1.1. *A function f of the form (1.1) is in the class $UST(\alpha)$, if*

$$\sum_{n=2}^{\infty} [(3 - \alpha)n - 2] |a_n| \leq (1 - \alpha)M_1,$$

where $M_1 > 0$ is a suitable constant. In particular, $f \in UST$ whenever

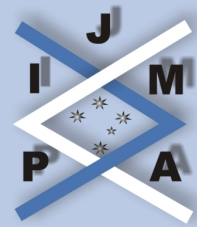
$$\sum_{n=2}^{\infty} (3n - 2) |a_n| \leq M_1.$$

Lemma 1.2. *A sufficient condition for a function f of the form (1.1) to be in the class $UCV(\alpha)$ is that $\sum_{n=2}^{\infty} n[(\alpha + 1)n - \alpha] |a_n| \leq M_2$, where $M_2 > 0$ is a suitable constant. In particular, $f \in UCV$ whenever $\sum_{n=2}^{\infty} n^2 |a_n| \leq M_2$.*

The Fox-Wright function [12, p. 50, equation 1.5] appearing in the present paper is defined by

$$(1.3) \quad {}_p\psi_q(z) = {}_p\psi_q \left[\begin{matrix} (a_j, \alpha_j)_{1,p}; \\ (b_j, \beta_j)_{1,q}; \end{matrix} z \right] = \sum_{n=0}^{\infty} \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n) z^n}{\prod_{j=1}^q \Gamma(b_j + \beta_j n) n!},$$

where α_j ($j = 1, \dots, p$) and β_j ($j = 1, \dots, q$) are real and positive and $1 + \sum_{j=1}^q \beta_j > \sum_{j=1}^p \alpha_j$.



[Title Page](#)

[Contents](#)

◀◀ ▶▶

◀ ▶

Page 5 of 14

[Go Back](#)

[Full Screen](#)

[Close](#)

2. Main Results

Theorem 2.1. *If*

$$\sum_{j=1}^q |b_j| > \sum_{j=1}^p |a_j| + 1, \quad a_j > 0 \quad \text{and} \quad 1 + \sum_{j=1}^q \beta_j > \sum_{j=1}^p \alpha_j,$$

then a sufficient condition for the function $z\{ {}_p\psi_q(z) \}$ to be in the class $UST(\alpha)$, $0 \leq \alpha < 1$, is

$$(2.1) \quad \left(\frac{3-\alpha}{1-\alpha} \right) {}_p\psi_q \left[\begin{matrix} (|a_j + \alpha_j|, \alpha_j)_{1,p}; \\ (|b_j + \beta_j|, \beta_j)_{1,q}; \end{matrix} 1 \right] + {}_p\psi_q \left[\begin{matrix} (|a_j|, \alpha_j)_{1,p}; \\ (|b_j|, \beta_j)_{1,q}; \end{matrix} 1 \right] \\ \leq M_1 + \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j}.$$

Proof. Since

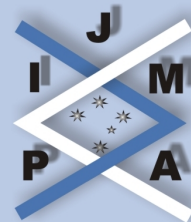
$$z\{ {}_p\psi_q(z) \} = \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j} z + \sum_{n=2}^{\infty} \frac{\prod_{j=1}^p \Gamma [a_j + \alpha_j(n-1)] z^n}{\prod_{j=1}^q \Gamma [b_j + \beta_j(n-1)](n-1)!}$$

so by virtue of Lemma 1.1, we need only to show that

$$(2.2) \quad \sum_{n=2}^{\infty} [(3-\alpha)n-2] \left| \frac{\prod_{j=1}^p \Gamma [a_j + \alpha_j(n-1)]}{\prod_{j=1}^q \Gamma [b_j + \beta_j(n-1)](n-1)!} \right| \leq (1-\alpha)M_1.$$

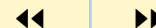
Now, we have

$$\sum_{n=2}^{\infty} [(3-\alpha)n-2] \left| \frac{\prod_{j=1}^p \Gamma [a_j + \alpha_j(n-1)]}{\prod_{j=1}^q \Gamma [b_j + \beta_j(n-1)](n-1)!} \right|$$



Title Page

Contents



Page 6 of 14

Go Back

Full Screen

Close

$$\begin{aligned}
 &= \sum_{n=0}^{\infty} [(3-\alpha)(n+2) - 2] \left| \frac{\prod_{j=1}^p \Gamma[a_j + \alpha_j(n+1)]}{\prod_{j=1}^q \Gamma[b_j + \beta_j(n+1)](n+1)!} \right| \\
 &= (3-\alpha) \sum_{n=0}^{\infty} \left| \frac{\prod_{j=1}^p \Gamma[(a_j + \alpha_j) + n\alpha_j]}{\prod_{j=1}^q \Gamma[(b_j + \beta_j) + n\beta_j]n!} \right| \\
 &\quad + (1-\alpha) \left[\sum_{n=0}^{\infty} \left| \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n)} \right| \frac{1}{n!} - \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j} \right] \\
 &= (3-\alpha) {}_p\psi_q \left[\begin{matrix} (|a_j + \alpha_j|, \alpha_j)_{1,p}; \\ (|b_j + \beta_j|, \beta_j)_{1,q}; \end{matrix} 1 \right] \\
 &\quad + (1-\alpha) {}_p\psi_q \left[\begin{matrix} (|a_j|, \alpha_j)_{1,p}; \\ (|b_j|, \beta_j)_{1,q}; \end{matrix} 1 \right] - (1-\alpha) \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j} \\
 &\leq (1-\alpha)M_1
 \end{aligned}$$

which in view of Lemma 1.1 gives the desired result. \square

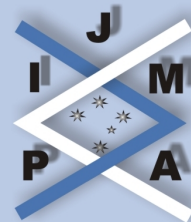
Theorem 2.2. *If*

$$\sum_{j=1}^q b_j > \sum_{j=1}^p a_j + 1, \quad a_j > 0 \quad \text{and} \quad 1 + \sum_{j=1}^q \beta_j > \sum_{j=1}^p \alpha_j,$$

then a sufficient condition for the function $z\{\psi_q(z)\}$ to be in the class $USTN(\alpha)$, $0 \leq \alpha < 1$, is:

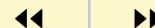
$$\left(\frac{3-\alpha}{1-\alpha} \right) {}_p\psi_q \left[\begin{matrix} (a_j + \alpha_j, \alpha_j)_{1,p}; \\ (b_j + \beta_j, \beta_j)_{1,q}; \end{matrix} 1 \right] + {}_p\psi_q \left[\begin{matrix} (a_j, \alpha_j)_{1,p}; \\ (b_j, \beta_j)_{1,q}; \end{matrix} 1 \right] \leq M_1 + \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j}.$$

Proof. The proof of Theorem 2.2 is a direct consequence of Theorem 2.1. \square



Title Page

Contents



Page 7 of 14

Go Back

Full Screen

Close

Theorem 2.3. If

$$\sum_{j=1}^q b_j > \sum_{j=1}^p a_j + 2, a_j > 0 \quad \text{and} \quad 1 + \sum_{j=1}^q \beta_j > \sum_{j=1}^p \alpha_j,$$

then a sufficient condition for the function $z\{_p\psi_q(z)\}$ to be in the class $UCV(\alpha)$, $0 \leq \alpha < 1$, is

$$(2.3) \quad (1 + \alpha) _p\psi_q \left[\begin{matrix} (a_j + 2\alpha_j, \alpha_j)_{1,p}; \\ (b_j + 2\beta_j, \beta_j)_{1,q}; \end{matrix} 1 \right] \\ + (2\alpha + 3) _p\psi_q \left[\begin{matrix} (a_j + \alpha_j, \alpha_j)_{1,p}; \\ (b_j + \beta_j, \beta_j)_{1,q}; \end{matrix} 1 \right] + _p\psi_q(1) \leq M_2 + \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j}.$$

Proof. By virtue of Lemma 1.2, it suffices to prove that

$$(2.4) \quad \sum_{n=2}^{\infty} n[(\alpha + 1)n - \alpha] \frac{\prod_{j=1}^p \Gamma[a_j + \alpha_j(n - 1)]}{\prod_{j=1}^q \Gamma[b_j + \beta_j(n - 1)](n - 1)!} \leq M_2.$$

Now, we have

$$(2.5) \quad \sum_{n=2}^{\infty} n[(\alpha + 1)n - \alpha] \frac{\prod_{j=1}^p \Gamma[a_j + \alpha_j(n - 1)]}{\prod_{j=1}^q \Gamma[b_j + \beta_j(n - 1)](n - 1)!} \\ = (1 + \alpha) \sum_{n=1}^{\infty} (n + 1)^2 \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma[(b_j + \beta_j n)n!]} \\ - \alpha \sum_{n=1}^{\infty} (n + 1) \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n)n!}.$$



Title Page

Contents

◀ ▶

◀ ▶

Page 8 of 14

Go Back

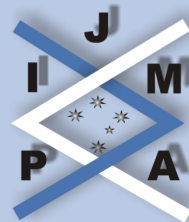
Full Screen

Close

Using $(n+1)^2 = n(n+1) + (n+1)$, (2.5) may be expressed as

$$\begin{aligned}
 (2.6) \quad & (1+\alpha) \sum_{n=1}^{\infty} (n+1) \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n)(n-1)!} \\
 & + \sum_{n=1}^{\infty} (n+1) \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n)n!} \\
 & = (1+\alpha) \sum_{n=2}^{\infty} \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n)(n-2)!} \\
 & + (2\alpha+3) \sum_{n=0}^{\infty} \frac{\prod_{j=1}^p \Gamma[(a_j + \alpha_j) + \alpha_j n]}{\prod_{j=1}^q \Gamma[(b_j + \beta_j) + \beta_j n]n!} \\
 & + \sum_{n=1}^{\infty} \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n)n!} \\
 & = (1+\alpha) {}_p\psi_q \left[\begin{matrix} (a_j + 2\alpha_j, \alpha_j)_{1,p}; \\ (b_j + 2\beta_j, \beta_j)_{1,q}; \end{matrix} \middle| 1 \right] \\
 & + (2\alpha+3) {}_p\psi_q \left[\begin{matrix} (a_j + \alpha_j, \alpha_j)_{1,p}; \\ (b_j + \beta_j, \beta_j)_{1,q}; \end{matrix} \middle| 1 \right] + {}_p\psi_q(1) - \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j},
 \end{aligned}$$

which is bounded above by M_2 if and only if (2.3) holds. Hence the theorem is proved. \square



Title Page

Contents

◀◀ ▶▶

◀ ▶

Page 9 of 14

Go Back

Full Screen

Close

3. An Integral Operator

In this section we obtain sufficient conditions for the function

$${}_p\phi_q \left[\begin{matrix} (a_j, \alpha_j)_{1,p}; \\ (b_j, \beta_j)_{1,q}; \end{matrix} z \right] = \int_0^z {}_p\psi_q(x) dx$$

to be in the classes *UST* and *UCV*.

Theorem 3.1. *If*

$$\sum_{j=1}^q b_j > \sum_{j=1}^p a_j, \quad a_j > 0 \quad \text{and} \quad 1 + \sum_{j=1}^q \beta_j > \sum_{j=1}^p \alpha_j,$$

then a sufficient condition for the function ${}_p\phi_q(z) = \int_0^z {}_p\psi_q(x) dx$ to be in the class *UST* is

$$(3.1) \quad 3 {}_p\psi_q(1) - 2 {}_p\psi_q \left[\begin{matrix} (a_j - \alpha_j, \alpha_j)_{1,p}; \\ (b_j - \beta_j, \beta_j)_{1,q}; \end{matrix} 1 \right] + 2 \frac{\prod_{j=1}^p \Gamma(a_j - \alpha_j)}{\prod_{j=1}^q \Gamma(b_j - \beta_j)} \leq M_1 + \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j}.$$

Proof. Since

$$(3.2) \quad {}_p\phi_q(z) = \int_0^z {}_p\psi_q(x) dx = \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j} z + \sum_{n=2}^{\infty} \frac{\prod_{j=1}^p \Gamma[(a_j - \alpha_j) + \alpha_j n]}{\prod_{j=1}^q \Gamma[(b_j - \beta_j) + \beta_j n]} \frac{z^n}{n!},$$



Title Page

Contents

◀ ▶

◀ ▶

Page 10 of 14

Go Back

Full Screen

Close

we have

$$\begin{aligned}
 (3.3) \quad & \sum_{n=2}^{\infty} (3n-2) \frac{\prod_{j=1}^p \Gamma[(a_j - \alpha_j) + \alpha_j n]}{\prod_{j=1}^q \Gamma[(b_j - \beta_j) + \beta_j n] n!} \\
 &= 3 \sum_{n=1}^{\infty} \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n) n!} - 2 \left[\sum_{n=0}^{\infty} \frac{\prod_{j=1}^p \Gamma[(a_j - \alpha_j) + \alpha_j n]}{\prod_{j=1}^q \Gamma[(b_j - \beta_j) + \beta_j n] n!} \right. \\
 &\quad \left. - \frac{\prod_{j=1}^p \Gamma(a_j - \alpha_j)}{\prod_{j=1}^q \Gamma(b_j - \beta_j)} - \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j} \right] \\
 &= 3 {}_p\psi_q(1) - 2 {}_p\psi_q \left[\begin{matrix} (a_j - \alpha_j, \alpha_j)_{1,p}; \\ (b_j - \beta_j, \beta_j)_{1,q}; \end{matrix} 1 \right] \\
 &\quad + 2 \frac{\prod_{j=1}^p \Gamma(a_j - \alpha_j)}{\prod_{j=1}^q \Gamma(b_j - \beta_j)} - \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j}.
 \end{aligned}$$

In view of Lemma 1.1, (3.3) leads to the result (3.1). □

Theorem 3.2. *If*

$$\sum_{j=1}^q b_j > \sum_{j=1}^p a_j, a_j > 0 \quad \text{and} \quad 1 + \sum_{j=1}^q \beta_j > \sum_{j=1}^p \alpha_j,$$

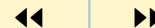
then a sufficient condition for the function ${}_p\phi_q(z) = \int_0^z {}_p\psi_q(x) dx$ to be in the class UCV is

$$(3.4) \quad {}_p\psi_q \left[\begin{matrix} (a_j + \alpha_j, \alpha_j)_{1,p}; \\ (b_j + \beta_j, \beta_j)_{1,q}; \end{matrix} 1 \right] + {}_p\psi_q(1) \leq M_2 + \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j}.$$



Title Page

Contents



Page 11 of 14

Go Back

Full Screen

Close

journal of **inequalities**
in pure and applied
mathematics

issn: 1443-5756

Proof. Since ${}_p\phi_q(z)$ has the form (3.2), then

$$\begin{aligned}
 (3.5) \quad & \sum_{n=2}^{\infty} n^2 \frac{\prod_{j=1}^p \Gamma[(a_j - \alpha_j) + \alpha_j n]}{\prod_{j=1}^q \Gamma[(b_j - \beta_j) + \beta_j n] n!} \\
 &= \sum_{n=1}^{\infty} (n+1) \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n) n!} \\
 &= \sum_{n=0}^{\infty} \frac{\prod_{j=1}^p \Gamma[(a_j + \alpha_j) + \alpha_j n]}{\prod_{j=1}^q \Gamma[(b_j + \beta_j) + \beta_j n] n!} + \sum_{n=0}^{\infty} \frac{\prod_{j=1}^p \Gamma(a_j + \alpha_j n)}{\prod_{j=1}^q \Gamma(b_j + \beta_j n) n!} - \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j} \\
 &= {}_p\psi_q \left[\begin{matrix} (a_j + \alpha_j, \alpha_j)_{1,p}; \\ (b_j + \beta_j, \beta_j)_{1,q}; \end{matrix} 1 \right] + {}_p\psi_q(1) - \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j},
 \end{aligned}$$

which in view of Lemma 1.2 gives the desired result (3.4). □

4. Particular Cases

4.1. By setting $\alpha_1 = \alpha_2 = \cdots = \alpha_p = 1; \beta_1 = \beta_2 = \cdots = \beta_q = 1$ and

$$M_1 = M_2 = M_3 = \frac{\prod_{j=1}^p \Gamma a_j}{\prod_{j=1}^q \Gamma b_j},$$

Theorems 2.1, 2.3, 3.1 and 3.2 reduce to the results recently obtained by Shanmugam, Ramachandran, Sivasubramanian and Gangadharan [11].

4.2. By specifying the parameters suitably, the results of this paper readily yield the results due to Dixit and Verma [1].

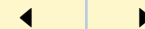
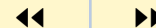


Uniformly Starlike and
Uniformly Convex Functions
V.B.L. Chaurasia and
Amber Srivastava

vol. 9, iss. 1, art. 30, 2008

Title Page

Contents



Page 12 of 14

Go Back

Full Screen

Close

journal of **inequalities**
in pure and applied
mathematics

issn: 1443-5756

References

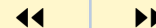
- [1] K.K. DIXIT AND V. VERMA, Uniformly starlike and uniformly convexity properties for hypergeometric functions, *Bull. Cal. Math. Soc.*, **93**(6) (2001), 477–482.
- [2] A. GANGADHARAN, T.N. SHANMUGAM AND H.M. SRIVASTAVA, Generalized hypergeometric functions associated with k -uniformly convex functions, *Comput. Math. Appl.*, **44** (2002), 1515–1526.
- [3] A.W. GOODMAN, On uniformly convex functions, *Ann. Polon. Math.*, **56** (1991), 87–92.
- [4] A.W. GOODMAN, On uniformly starlike functions, *J. Math. Anal. and Appl.*, **155** (1991), 364–370.
- [5] S. KANAS AND F. RONNING, Uniformly starlike and convex functions and other related classes of univalent functions, *Ann. Univ. Mariae Curie-Skłodowska Section A*, **53** (1999), 95–105.
- [6] S. KANAS AND H.M. SRIVASTAVA, Linear operators associated with k -uniformly convex functions, *Integral Transform Spec. Funct.*, **9** (2000), 121–132.
- [7] G. MURUGUSUNDARAMOORTHY, Study on classes of analytic function with negative coefficients, Thesis, Madras University (1994).
- [8] S. OWA, J.A. KIM AND N.E. CHO, Some properties for convolutions of generalized hypergeometric functions, *Surikaiseikikenkyusho Kokyuroku*, **1012** (1997), 92–109.



Uniformly Starlike and
Uniformly Convex Functions
V.B.L. Chaurasia and
Amber Srivastava
vol. 9, iss. 1, art. 30, 2008

Title Page

Contents



Page 13 of 14

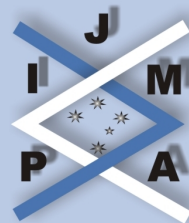
Go Back

Full Screen

Close

journal of **inequalities**
in pure and applied
mathematics

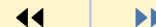
issn: 1443-5756



- [9] C. RAMACHANDRAN, T.N. SHANMUGAM, H.M. SRIVASTAVA AND A. SWAMINATHAN, A unified class of k -uniformly convex functions defined by the Dziok-Srivastava linear operator, *Appl. Math. Comput.*, **190** (2007), 1627–1636.
- [10] S. SHAMS, S.R. KULKARNI AND J.M.JAHANGIRI, Classes of uniformly starlike and convex functions, *Internat. J. Math. Sci.*, **55** (2004), 2959–2961.
- [11] T.N. SHANMUGAM, C. RAMACHANDRAN, S. SIVASUBRAMANIAN AND A. GANGADHARAN, Generalized hypergeometric functions associated with uniformly starlike and uniformly convex functions, *Acta Ciencia Indica*, **XXXIM**(2) (2005), 469–476.
- [12] H.M. SRIVASTAVA AND H.L. MANOCHA, *A Treatise on Generating Functions*, Halsted Press (Ellis Horwood Limited, Chichester), John Wiley and Sons, New York, Chichester, Brisbane, and Toronto, 1984.
- [13] H.M. SRIVASTAVA AND A.K. MISHRA, Applications of fractional calculus to parabolic starlike and uniformly convex functions, *Computer Math. Appl.*, **39** (2000), 57–69.
- [14] H.M. SRIVASTAVA, A.K. MISHRA AND M.K. DAS, A class of parabolic starlike functions defined by means of a certain fractional derivative operator, *Fract. Calc. Appl. Anal.*, **6** (2003), 281–298.

Title Page

Contents



Page 14 of 14

Go Back

Full Screen

Close

journal of **inequalities**
in pure and applied
mathematics

issn: 1443-5756