



**CENTRE FOR MATHEMATICAL SCIENCES
(CMS)
Established in 1977**

**A nonprofit scientific research and training centre registered
under the Travancore-Cochin Registration Act of 1955.
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**From 2006 onwards CMS is a Department of Science and
Technology, Government of India, New Delhi (DST) Centre for
Mathematical Sciences, fully financed by DST, Delhi**



Office

CENTRE FOR MATHEMATICAL SCIENCES

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Regular full-time faculty at CMS (May 2009)

Dr. A Sukumarnan Nair (Ph.D., Professor, Mathematics Education, former Vice-Chancellor of MG University, **Chairman of CMS**, full-time, not salaried, honorary work, retired, directing research, approved research guide of MG University)

Dr. A.M. Mathai (Ph.D., **Director**, Emeritus Professor of Mathematics and Statistics, McGill University, Canada, full-time, still very active in research, not salaried, doing honorary work and there is a small honorarium to cover local travel expenses, guiding research)

Dr. K.S.S. Nambooripad (Ph.D., Professor, coordinator of the South Campus, doing honorary work, retired, active in research and guiding research)

Dr. B.D. Acharya (Ph.D., Professor, regular, salaried, as of 1 January 2010 or later)

Dr. K.K. Jose (Ph.D., Coordinator of CMS Pala Campus, doing collaborative research and research guidance at CMS, Principal, St. Thomas College Palai, guiding research at CMS)

Dr. R Natarajan (Ph.D., Assistant Professor/Reader, recruited on 10th December 2007 from Lakehead University, Canada, full-time, salaried, in charge of creating a research unit of Discrete Mathematics Applied to Chemistry and a Computer Science Unit at CMS, not yet a research guide)

Dr. Manoj Pandey (Ph.D., Assistant Professor recruited on 1st July 2008, full time, salaried, working in the area of partial differential equations, shock waves, not yet a research)

Dr. K.S. Kripalini (Ph.D.) Visiting Scientist (long term) at Associate Professor level, full time, salaried, working in Algebra and Analysis, research guide of Kerala University and guiding research work at CMS

Life Members of CMS

These are distinguished faculty who are also research guides at CMS and participants of all activities of CMS but not stationed at CMS and not salaried from CMS but in contact with CMS and its research scholars and faculty almost on daily basis through e-mail.

Professor Dr. Hans Haubold (Ph.D., Office of Outer Space Affairs, United Nations, very active in collaborative research and research guidance at CMS, research guide at CMS)

Professor Dr. R.K. Saxena (Ph.D., Emeritus Professor, Jodhpur, very active in collaborative research and research guidance at CMS)

Dr. B.D. Acharya (Ph.D., Retired, former advisor to Government of India, collaborative research and planning to do research guidance at CMS)

Adjunct Professors at CMS

These are not stationed at CMS but are full participants in all activities of CMS including collaborative research and research guidance, not salaried from CMS.

Dr. K.A. Germina (Ph.D., Coordinator of the Hill Area Campus of CMS at Mananthavady, Kerala, India, research guide at CMS)

Research Associates

These are not stationed at CMS and not salaried but are research guides at CMS and participants in collaborative research work at CMS.

Dr. Anil Kumar (Ph.D., Deputy Director, VSSC Research Centre, research guide at CMS)

Dr. Sebastian George (Ph.D., Department of Statistics, St. Thomas College Palai, Kerala, research guide at CMS)

Dr. Sunil C. Mathew (Ph.D., Department of Mathematics, St. Thomas College Palai, Kerala, research guide at CMS)

Dr. Vincent Mathew (Ph.D., Department of Physics, St. Thomas College Palai, Kerala, research guide at CMS)

Other Staff

V. Vishnudas, Liaison Officer (M.Sc, assisting the Director in coordinating all programs of CMS, liaison with university, government and other agencies; regular salaried position)

Rejitha George (M.Sc, **Research Assistant** in charge of TEX typing, research publications and general correspondence; receptionist, regular salaried position)

Sini Devassy (**Research Assistant** and office manager, in charge of accounts, Newsletter, printing unit, page-making, photoshop etc; regular salaried position)

R. Abhilash (**Technical Assistant**, printing unit)

Shaji, K.K. (**Technical Assistant**, printing unit)

Current (May 2009) research scholars at CMS:

DST-SRF Mrs Shanoja S. Pai (Shanoja R. Naik) (M.Sc, Supervisor: Dr. K. K. Jose ; Area: Stochastic Processes; submitted her Ph.D thesis, expected to receive her Ph.D in 2009)

DST-SRF Anjaly P. Jose (M.Sc, Supervisor: Dr. Sunil C. Mathew; Area: Fuzzy Topology, on leave from CMS now, can submit her Ph.D thesis in 2009-2010)

DST-SRF Gishamol Mathew (M.Sc, Supervisor: Dr. Vincent Mathew; Area: Theoretical Physics, on leave from CMS at present, can submit her Ph.D thesis in 2009-2010)

DST-SRF Nicy Sebastian (M.Sc, Supervisor: Dr. A.M. Mathai/Dr. Sebastian George/Dr. A.A. Kilbas; Area: Fractional Calculus and Statistical Distributions, several papers already)

DST-SRF Seema S. Nair (M.Sc, Supervisor: Dr. A.M. Mathai/Dr. R.K. Saxena (Life Member, CMS); Area; Fractional Calculus, two international papers already)

DST-SRF Dilip Kumar (M.Sc, Supervisor: Dr. A.M. Mathai/Dr. H.J. Haubold (Life Member, CMS); Area: Reaction Rate Theory and Pathway Model, three papers already)

DST-SRF Dhannya P. Joseph (M.Sc, Supervisor: Dr. Sebastian George/Dr.A.M. Mathai; Area: Statistical Distributions, two papers already)

DST-JRF Anitha Kattuveetil (M.Sc, Supervisor: Dr. A.M. Mathai/Dr. R.K. Saxena; Area: Dirichlet averages, on leave from CMS, three papers already)

DST-JRF Manu Mariam Thomas (M.Sc, Supervisor: Dr. K. K. Jose; Area: Stochastic Processes, one paper, beginning stage)

DST-JRF Mayamol, E.V. (M.Sc, Supervisor: Dr. A.M. Mathai/ Seemon Thomas; Area: Statistical Distributions, one paper submitted)

DST-JRF Jis Joseph (M.Sc, Supervisor: Dr. Sunil C. Mathew; Area: Fuzzy Topology, beginning)

DST-JRF Remya, R. (M.Sc, Supervisor: Dr. R. Natarajan, graph theory applied to chemistry)

DST-JRF Alphy Joseph (M.Phil, recruited on 17 January 2009)

DST-JRF Ginu Varghese (M.Sc, recruited on 17 January 2009)

DST-JRF Sona Jose (M.Sc, recruited on 17 January 2009)

DST-JRF Najju M. Thomas (M.Sc, recruited on 17 January 2009)

DST-JRF Diana Mary George (M.Sc, recruited on 17 January 2009)

Undergraduate fellowship holders (May 2009)

Tiju Cherian
Surabhi Sudheeran
Gayathri Varma

Honors and Awards (May 2009)

CMS is proud to announce the following recent honors and awards during the period since the publication of the last issue (Vol.11, No.2, 2008) of CMS Newsletter.

1. Dr. A.M. Mathai was elected as the regional representative for the Southern Region of India in the Mathematical Sciences Division of the Indian Science Congress Association, at the 96th Indian Science Congress held at Shillong, Meghalaya.. He is asked to be a co-editor of the Proceedings of the UN /ESA /NASA Workshop held in Tokyo, Japan in 2008 and he accepted the invitation. Some of the papers appeared in the special issue of the journal, *Earth, Moon and Planets*, Volume **104**, Numbers **1-4**, April 2009, edited by C. Briand, E. Antonucci, N. Gopalswam, G. Eichhorn, T. Sakurai, A.M. Mathai and H.J. Haubold. The remaining papers will appear in the special issue of the journal *Astrophysics & Space Science* edited by H.J. Haubold and A.M. Mathai

2. DST-SRF Dilip Kumar of CMS won the second prize for the best paper presentation award in the all-India research scholars' meet held at IIT Kanpur, on 6-10 December 2008. His presentation was on an integral transform that he introduced recently, called P-transform or Pathway Transform, based on the pathway model of Mathai (2005, *Linear Algebra and Its Applications*, **396**, 317-328). The first prize went to a participant from IIT Kanpur. Earlier, Dilip had won the best paper award at the Rajasthan Ganita Parishad and all-India conference held at Jodhpur, Rajasthan, India.

3. DST-SRF Shanoja S. Pai (Shanoja R. Naik) of CMS was the first runner up for the only Young Scientist Award at the 96th Indian Science Congress in the Mathematical Sciences division. She was one among the three short-listed for oral presentation. She went to Shillong in December 2008 and presented her paper on asymmetric q-Weibull stochastic process and related areas. A participant from IIT Kanpur won the only prize. Earlier Shanoja had won the best paper award at the annual conference of the Society for Special Functions and Their Applications, held at Pala.

4. DST-SRF Nicy Sebastian of CMS won the Young Statistician Award of the Kerala Statistical Association at the annual conference held at Kanhangad, Kerala, India, from 12th to 14th February 2009.

5. Dr A.M. Mathai is on the International Scientific Organizing Committee of the 2009 UN /NASA /ESA /JAXA Workshop on Basic Space Science and the International Heliophysical year 2007 and 2009 UN BSS & IHY Workshop, September 21-25, 2009 Daejeon, Korea

6. Dr A.M. Mathai is on the Scientific Advisory Committee of the International Conference on “Analytic Methods of Analysis and Differential Equations” (AMASE-2009) to be held from 13 to 19 September 2009 at the Belrusian State University and the Institute of Mathematics of the Belarusian National Academy of Science, Belarus

7. Dr A.M. Mathai is nominated to be one of the Chair Members of Division XII/ Commission 46/ Program Group Collaborative Programmes of the International Astronomical Union.

Areas of Research Undertaken and Research Teams at CMS

Research work at CMS covers several areas of Mathematics, Statistics and Astrophysics. The following research teams are operating from CMS and these teams are very active in interdisciplinary research work. [A write up about the teams is available from Volume 10, Number 2, 2007 of the Newsletter of CMS].

1. Astrophysics Research Group at CMS. The seniors in the group are Dr. H.J. Haubold (Life Member of CMS) and Dr. A.M. Mathai (Director). Recently Dr. R.K. Saxena of Jodhpur [Life Member of CMS] also joined this group. A large number of papers are published by this group in top-level international research journals. Recent papers of the group may be seen from the journals: *Physica A*, *Astrophysics & Space Science* and others. JRF in the team is Dilip Kumar [He got one paper published in the European journal *Astroparticle Physics*, he has one paper in the conference proceedings, one paper written with Dr. A.A. Kilbas of Belarussian University (Belarus). He presented another paper in a national conference at Jodhpur in October 2007 which will appear in the proceedings]. He visited IUCA in Pune for 10 days and he presented a paper at the prestigious COSPAR meeting in Montreal, Canada. The second JRF in the team is Dhannya P. Joseph [She has sent two papers for publication to an international journal, one with Dr. H.J. Haubold] .

2. Fractional Calculus Research Group at CMS. The seniors in the group are Dr. R.K. Saxena (Life Member of CMS), Dr. A.M. Mathai and Dr. H.J. Haubold [Life Member of CMS]. Over a dozen papers are published by this group. Recent papers of the group may be seen from UN Workshop proceedings, *Astrophysics & Space Science* and others. JRFs working in this group are Seema S. Nair, Anitha

Kattuveltil and Nicy Sebastian (recently switched from Statistics to Fractional Calculus). Seema and Kattuveltil got one joint paper published in the local journal STARS. They got one paper accepted in *Astrophysics & Space Science*, they presented this accepted paper and another paper in a national conference at Jodhpur in October 2007]. Anitha got one paper published in the prestigious European journal in the area *Fractional calculus and Applied Analysis* (A.A. Kilbas and Anitha Kattuveltil). Nicy got one paper published in the European journal: *Integral Transforms and Special Functions* and one paper accepted in another European journal.

3. Special Functions Research Group at CMS. The seniors in the group are Dr. R.K. Saxena, Dr. P.N. Rathie, Dr. S.B. Provost, Dr. P. Moschopoulos and Dr. AM. Mathai. “*Special Functions for Applied Scientists*” is the latest book of this group, which was out from Springer, New York in March 2008. A revised and updated version of the famous Mathai-Saxena book of 1978 is recently brought out as Publication No.37 of CMS, titled, “*H-function: Theory and Applications*”. This will be published later from a leading international commercial publisher. Recent papers may be seen from the top-level international journals: *Linear Algebra and Its Applications* (2005, 2006, 2007), *IEEE Transactions on Reliability* (2006) and others. JRFs working in this area are Nicy Sebastian and Dhannya P. Joseph. Parts of the work of Dilip Kumar and Anitha Kattuveltil are also in this area.

4. Statistical Distribution Theory Research Group at CMS. The seniors in the group are Dr. A.M. Mathai, Dr. S.B. Provost, Dr. W.J. Anderson and Dr. P.N. Rathie. Various generalizations of Dirichlet integrals and Dirichlet densities are introduced by this group recently. Seemon Thomas of St. Thomas College Palai has received his Ph.D in this area. The pathway model introduced by Mathai in 2005 (*Linear Algebra and Its Applications*) is very popular in statistical distribution theory and non-extensive statistical mechanics now. Shanoja S.Pai, SRF at CMS submitted her Ph.D thesis in this area in December 2008 to M.G. University, Kerala.

5. Geometrical Probability Research Group at CMS. Dr. A.M. Mathai is the senior in this group and Seemon Thomas has joined and is working in the group.

6. Stochastic Process Research Group at CMS. The senior in this group is Dr. K.K. Jose (Co-PI), Dr. Seetha Lekshmi, Dr. Alice Thomas and others. SRF Shanoja S. Pai has got three papers accepted for publication in international journals in this area. Manu Mariam (JRF) is also in this group.

7. Discrete Mathematics in Chemistry Research Group. This group is being set up. Dr. R. Natarajan of Lakehead University, who is appointed as Reader at CMS, is heading this group. Two JRFs working in this group are Remya, R. and Ganapathy, M. The activities of this group will also include in building up a strong computer science base at CMS and expect to produce patentable computer softwares.

Recent Publications from CMS (May 2009)

BOOKS

(a). Research Level Books Published

1. A.M. Mathai, R.K. Saxena and H.J. Haubold (2009): *The H-function: Theory and Applications*. [Accepted for publication by Springer, New York; to be out by September 2009; revised form of CMS Publication No.37]
2. A.M. Mathai and H.J. Haubold (2008): *Special Functions for Applied Scientists*, Springer, New York, pp.464+xxv.[Revised form of CMS Publication Number 35]
3. 2009 SERC School Notes [Multivariable Calculus with Applications: Model Building. CMS Publication No. 38, CMS Pala Campus]
4. H.J. Haubold, A.M. Mathai and R.K. Saxena (2008): *The H-function: Theory and Applications*, CMS Publication No. 37, CMS Pala Campus
5. 2008 SERC School Notes [Matrix Variable Calculus and Statistical Distribution Theory and Applications in Data Analysis, Model Building and Astrophysics Problems] CMS Publication No. 36, April 2008.
6. 2007 SERC School Notes [Special Functions and Their Applications} CMS Publication No. 34, April 2007.
7. *Special Functions for Applied Scientists* (preprint form of the Springer book), CMS Publication No.35, August 2007

(b). Modules (books at undergraduate-graduate level, self-study materials)

Old Modules updated and reprinted

8. A.M. Mathai (2008): Module 1: Vectors and Matrices (updated and reprinted in March 2008)
9. A.M. Mathai (2008): Module 2: Determinants and Eigenvalues (updated and reprinted in June 2008)
10. A.M. Mathai (2008): Module 3: Applications of Matrices and Determinants (updated and reprinted in March 2009)

New Modules produced

11. A.M. Mathai (2008): Module 4: Limits, Continuity, Convergence and Differential Calculus (new Module produced, prepared in December 2007 and printed in June 2008)
12. A.M. Mathai (2008): Module 5: Integrals and Integration (new Module produced, May 2008)

12* Joseph Manuel Panavelly (2008): Module 6: Basic Analysis (New Module, prepared in May 2008, will be modified and printed in 2009; not printed yet)

12** A.M. Mathai (2008): Module 7: Model Building (new Module, prepared in June 2008, will be revised and printed in 2009; not printed yet)

(b). Research Papers in Refereed International Journals

13. A.M. Mathai (2007): Random volumes under a general matrix-variate model. *Linear Algebra and Its Applications*, **425**, 162-170 (2007)

14. A.M. Mathai and H.J. Haubold (2007): Pathway model, superstatistics, Tsallis statistics and a generalized measure of entropy. *Physica A*, **375**, 110-122 (2007)

15. A.M. Mathai and H.J. Haubold (2007): On generalized entropy measures and pathways. *Physica A*, **385**, 493-500 (2007).

16. A.M. Mathai and H.J. Haubold (2007): On entropic, distributional and differential pathways. *Bull. Astr. Soc. India*, **35**, 669-680.

17. H.J. Haubold, A.M. Mathai and R.K. Saxena (2007): Solutions of fractional reaction-diffusion equations in terms of the H-function. *Bull. Astr. Soc. India*, **35**, 681-689.

18. M. Kitamura, D. Wentzel, A.A. Henden, J.Bennett, H.M.K. Al-Naimiy, A.M. Mathai and H.J. Haubold (2007): The United Nations Basic Space Science Initiative: The TRIPOD Concept. In "Astronomy for the developing world", J.B. Hearnshaw and P. Martines, Eds, International Astronomical Union, 2007, pp.277-284.

19. Seemon Thomas and A.M. Mathai (2008): On a matrix-variate generalized type-2 Dirichlet density. *Advances and Applications in Statistics*, **8(1)**, 37-56.

20. A.M. Mathai and H.J. Haubold (2008): Pathway parameter and thermonuclear functions. *Physica A*, **387**, 2462-2470.

21. A.M. Mathai and H. J. Haubold (2008): On generalized distributions and pathways. *Physics Letters A*, **372**, 2109-2113.

22. H.J. Haubold, A.M. Mathai and Seemon Thomas (2008): A pathway to multivariate Gaussian model. *Astrophysics & Space Science* (to appear, ArXiv:0709.3820v1[cond-mat.stat-mech] 24 Sep 2007)

23. R.K. Saxena, A.M. Mathai and H.J. Haubold (2008): Solutions of certain practical kinetic equations and a fractional diffusion equation. *Astrophysics & Space Science* (to appear), arXiv:0704.1916v1 [math.CA]15 Apr 2007

24. Seemon Thomas, Alex Thannippara and A.M. Mathai (2008): On a matrix-variate generalized type-1 Dirichlet model. *Journal of Probability and Statistical Science*, **6(2)**, 187-200.
25. A.M. Mathai (2009): Fractional integrals in the matrix-variate cases and connection to statistical distributions. *Integral Transforms and Special Functions* (to appear)
26. R. Natarajan and S.C. Basak (2009): Numerical characterization of molecular chirality of organic compounds. *Current Computer-Aided Drug Design*, **5**, 13-22.
27. R.K. Saxena, A.M. Mathai and H.J. Haubold (2009): An alternative method for solving a certain class of fractional kinetic equations. *Astrophysics & Space Science* (to appear)
28. R.K. Saxena, A.M. Mathai and H.J. Haubold (2009): Solutions of the fractional reaction equation and the fractional diffusion equation. *Astrophysics & Space Science* (to appear)

Papers in refereed conference proceedings

29. R. Natarajan (2008): In silico method for the selection of chelating mineral collectors. In the Proceedings of the International Seminar on Mineral Processing Technology MPT-2008, TVM, India, June 22-24, 2008, pp. 297-300.
30. R. Natarajan and I. Nirdosh (2008): Effect of substituents on the kinetics of flotation of a nickel ore by N-arylhydroxamic acids. In the Proceedings of the International Seminar on Mineral Processing Technology, MPT-2008, TVM, India, June 22-24, 2008, pp. 291-305.

(c). Research Papers by SRF/JRF

31. Dilip Kumar and Haubold, H.J. (2007): Extensions of thermonuclear functions through the pathway model including Maxwell-Boltzmann and Tsallis distributions *Astroparticle Physics*, **29**, 72-76.
32. Seema S. Nair and Anitha Kattuveltil (2007): Some aspects of Mittag-Leffler functions, their applications and some new insights, *STARS*, **1(2)**, 118-131.
33. Anjaly Jose and Sunil C. Mathew (2007) : Nice fuzzy topological spaces. *STARS*, **1(2)**, 156-162.
34. Jesly Jacob, Anju Babu, Gishamol Mathew and Vincent Mathew (2007): Propagation in long range surface plasmon waveguides on anisotropic substrate and cladding, *STARS*, **1(2)**, 163-167.

- 35.** Jose, K.K. and Shanoja R. Naik (2007): On q-Weibull distribution and its applications in survival and reliability analysis, *Proc. 8th Inter. Conf. Society for Special Functions and Their Applications*, **8**, 141-158.
- 36.** Gishamol Mathew, Anju Babu, Jesly Jacob, Vincent Mathew (2008): Magneto-optic phase shift in plasmon propagation along garnet/semiconductor-on-insular structures. *Superlattices and Microstructures*, **44**(2008),203-207.
- 37.** Jesly Jacob, Anju Babu, Gishamol Mathew, Vincent Mathew (2008). Propagation of surface plasmon polaritons in anisotropic MIM and IMI structures, *Superlattices and Microstructures* (accepted)
- 38.** A.A. Kilbas and Anitha Kattuveetil (2008): Representations of Dirichlet averages of generalized Mittag-Leffler function via fractional integrals and special functions. *Fractional Calculus & Applied Analysis*, **11**(4), 471-492.
- 39.** A.A. Kilbas and Nicy Sebastian (2008): Generalized fractional integration of the Bessel function of the first kind. *Integral Transforms and Special Functions*, **19**(12), 869-883.
- 40.** Seema S. Nair and Anitha Kattuveetil (2007): Some remarks on the paper “On the q-type distributions”. *Astrophysics & Space Science* (accepted)
- 41.** Nicy Sebastian (2008): Certain fractional integral and differential operators on modified Bessel function of the first kind. *STARS*, **2**(1), 50-64.
- 42.** Seema S. Nair (2008): Fractional calculus on a H-function and its special cases. *STARS*, **2**(1), 65-77.
- 43.** Anitha Kattuveetil (2008): On Dirichlet averages. *STARS*, **2**(1), 78-88.
- 44.** Dilip Kumar (2008): Generalized reaction rate probability integrals. *STARS*, **2**(1), 89-103.
- 45.** A.A. Kilbas and Nicy Sebastian (2008): Generalized fractional differentiation of the Bessel function of the first kind. *Mathematica Balkanica (New Series)*, **22** (3-4), 323-346.
- 46.** K..K. Jose and Shanoja R. Naik (2008): A class of asymmetric pathway distributions and an entropy interpretation. *Physica A*, **387**, 6943-6951.
- 47.** K.K. Jose, Shanoja, R. Naik and Miroslav M. Ristic (2008): Marshall-Olkin q-Weibull distribution and max-min processes. *Statistical papers* (accepted)
- 48.** K.K. Jose and Shanoja R. Naik (2009): On the q-Weibull distribution and its applications. *Communications in Statistics – Theory and Methods*, **38**, 912-926.

49. Shanoja R. Naik and Jose, K.K. (2008): Mittag-Leffler functions and a pure-birth process. *STARS*, **2(1)**, 29-40.
50. Shanoja R. Naik and Jose, K.K. (2008): Semi q-Weibull distributions and autoregressive processes, *STARS*, 2(2), 139-152.
51. Remya Rajappan, Prashant D. Shingade, Ramanathan Natarajan and Valadi K. Jayaraman (2009): Quantitative structure – property relationship (QSPR) prediction of liquid viscosities of pure organic compounds employing random forest regression. *Ind. Eng. Chem. Res* (accepted)
52. Seema S. Nair (2009): Pathway fractional integration operator. *Fractional Calculus & Applied Analysis*, **12(3-4)** (accepted)
53. Anatoly A. Kilbas and Seema S. Nair (2009): Fractional calculus of the generalized Wright function. *Mathematical Sciences Research Journal* (USA), (accepted)
54. Dhannya P. Joseph (2009): Gamma distribution and extensions by using pathway model. *Statistical Papers* (Germany),(accepted)
55. Seema S. Nair and Anitha Kattuveltil (2009): Some remarks on the paper “On the q-type distributions”. *Astrophysics & Space Science* (accepted)
56. Dhannya P. Joseph and H.J. Haubold (2009): Extended reaction rate integrals as solutions of some general differential equations. *Astrophysics & Space Science* (accepted)