Calc: Papers

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This writeup follows Calc2 and lists papers I read, sorted by their ideas.

Definition of frequently used formulas:

$$\begin{aligned} \mathrm{d}s^2 &= -f(r)\mathrm{d}t^2 + f^{-1}(r)\mathrm{d}r^2 + r^2\mathrm{d}\Omega^2 \\ T_H &= \left(\frac{1}{4\pi}\frac{\mathrm{d}g_{00}}{\mathrm{d}r}\right)_{r=r_H} \\ \gamma(s;x) &= \int_0^x t^{s-1}e^{-t}\mathrm{d}t \end{aligned}$$

Contents

1 Papers using NC approaches

1.1 NSS 2006

Title Noncommutative geometry inspired Schwarzschild black hole

Keywords NC

Genutzt von Rizzo 2006

Auch eines der wichtigsten, die ich gelesen habe.

$$\rho_\theta(r) = \frac{M}{(4\pi\theta)^{3/2}} e^{-r^2/4\theta} \tag{1}$$

$$f(r) = 1 - \frac{4M}{r\sqrt{\pi}}\gamma(3/2, r^2/4\theta) \tag{2}$$

$$r_H = \frac{4M}{\sqrt{\pi}}\gamma(3/2; r_H^2/4\theta) \tag{3}$$

$$T_H = \frac{1}{4\pi r_H}\left(1 - \frac{r_H^3}{4\theta^{3/2}}\frac{e^{-r_H^2/4\theta}}{\gamma(3/2, r_H^2/4\theta)}\right) \tag{4}$$

1.2 Rizzo 2006

Title Noncommutative inspired black holes in extra dimensions

Basiert auf NSS 2006 NC Ansatz (Section 1.1)

$$\rho_\theta(r) = \frac{M}{(4\pi\theta)^{3/2}} e^{-r^2/4\theta} \tag{5}$$

$$\to \frac{M}{(4\pi\theta)^{(n+3)/2}} e^{-r^2/4\theta} \tag{6}$$

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2 Other papers

2.1 N Aug 2010

Title Entropic force, noncommutative gravity and ungravity

Keywords Emergent gravity, Verlinde

Basic Ideas Newton $F(r)$ herleiten aus $S = k_B \ln N$. Später mit n Raumdimensionen und in $\mathcal{G}$ einige Effekte.

$$f(r) = 1 - \frac{2M}{r^{n-2}c^2}\mathcal{G}(r) \tag{7}$$

$$F = \frac{GMm}{r^2}\left(1 + 4L^2\frac{\partial S}{\partial A}\right) \tag{8}$$

Nicht so passend zum Thema $f(r)$.

2.2 N Feb 2012

Title Nonlocal and generalized uncertainity principle black holes

Keywords EH-Action

Basic Ideas Operator $\mathcal{A}(x-y)$, running $\mathcal{G}(r)$, Length scale l of theory

Nicht passend zum Thema.

$$
\begin{aligned}
S &= \frac{1}{16\pi G}\int \mathrm{d}^4x\sqrt{-g}\mathcal{R}(x)\\
\mathcal{R}(x) &= \int \mathrm{d}^4y\sqrt{-g}\mathcal{A}^2(x-y)R(y)\\
\mathcal{A}^2(x-y) &= \mathcal{A}^2(\Box_x)\delta^4(x-y)\\
\Box_x &= l^2 g_{\mu\nu}\nabla^\mu\nabla^\nu\\
\mathcal{A}(p^2) &= \exp(l^2p^2/2)\ldots\\
\mathcal{T}_{\mu\nu} &= \mathcal{A}^{-2}(\Box)T_{\mu\nu}\\
f(r) &= 1-\frac{GM\gamma(2;r/\sqrt{\beta})}{r}
\end{aligned}
$$

3 Papers using Holographic approaches

3.1 NS Okt 2012

Title Holographic screens in ultraviolet self-complete quantum gravity

Keywords Holography

Das Hauptpaper, was ich als erstes las, darüber geht auch Calc1.

Das Paper umfasst zwei Ansätze, $h_\alpha(r)$ und $h(r)$.

Im ersten Ansatz setzt Bedingung $M_P = M_0$, $M_0 = M(r_0)$ das $\alpha = \alpha_0$, $r_0 = L_P$. Im zweiten Ansatz wird eine der drei Bedigungen an eine Metrik verworfen.

$$f(r) = 1-\frac{2MG}{r}h_{\alpha,\ldots}(r) \tag{9}$$

$$h_\alpha(r) = \frac{r^3}{(r^\alpha+(\tilde{r}_0)^\alpha/2)^{3/\alpha}} \tag{10}$$

$$h(r) = \frac{r^2}{r^2+L^2} = 1-\frac{L^2}{r^2+L^2} \tag{11}$$

$$\rho(r) = \frac{M}{2\pi r}\frac{L^2}{(r^2+L^2)^2} \tag{12}$$

$$m(r) = \frac{Mr^2}{L^2+r^2} = M-\frac{LM}{L^2+r^2} \tag{13}$$

3.2 NS 06.11.2013

Title Holographic screens in ultraviolet self-complete quantum gravity

Keywords Holography

Source Elsevier Preprint by Mail am 12.11.13

$$\rho(r) = \frac{M}{4\pi r^2}\delta(r) \tag{14}$$

$$\delta(r) = \frac{\mathrm{d}}{\mathrm{d}r}\Theta(r) \tag{15}$$

$$\Theta(r) \to h(r) \tag{16}$$

$$\rho(r) = \frac{M}{4\pi r^2}\frac{\mathrm{d}}{\mathrm{d}r}h(r) = T_0^0 \tag{17}$$

$$h(r) = 1-L^2/(r^2+L^2) \tag{18}$$

$$\sigma_h = M/(4\pi r_h^2) \tag{19}$$

4 Papers using Self-Completeness and Self-Regular approaches

4.1 NIM 07.11.2013

Title Self-Completeness and the Generalized Uncertainity Principle

Keywords -

Ein neues veröffentlichtes Paper auf ArXiv, parallel zum Preprint. Erstmals hübsche Bilder. Herleitung von $f(r)$ aus Operator $\mathcal{A}$:

$$f(r) = 1 - 2\frac{GM}{c^2 r}\gamma(2; \frac{r}{\sqrt{\beta}}) \tag{20}$$
