Project 5, FYS 3150 / 4150, fall 2013

Odd Petter Sand and Nathalie Bonatout

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All our source code can be found at our GitHub repository for this project: https://github.com/OPSand/Project5/

1 Introduction

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2 Theory

2.1 Derivation of τ_{crunch} (optional)

(OPS)

2.2 Lack of a singularity in our model

(OPS)

2.3 G in units of ly, $M_{\odot}$ and τ_{crunch}

We can rewrite

$$\tau_{crunch} = \sqrt{\frac{3\pi}{32G\rho_0}}$$

as

$$G_{yr} = \frac{3\pi}{32\tau_{crunch}^2\rho_0}.$$

Now we use the definitions of average mass $\mu = \frac{M}{N}$ and initial mass density for a sphere $\rho_0 = \frac{M}{V_0} = \frac{\mu N}{\frac{4}{3}\pi R_0^3} = \frac{3\mu N}{4\pi R_0^3}$, and we get

$$G_{yr} = \frac{3\pi}{32\tau_{crunch}^2}\frac{4\pi R_0^3}{3\mu N} = \frac{\pi^2 R_0^3}{8\tau_{crunch}^2 \mu N}$$

in units of $\frac{ly^3}{M_{\odot} yr^2}$. To get this in units of $\frac{ly^3}{M_{\odot} \tau_{crunch}^2}$ as desired, we use:

$$G = G_{yr}(\frac{yr}{\tau_{crunch}})^2 = G_{yr}\tau_{crunch}^2$$

assuming thatτ_{crunch} is given in years.

2.4 Gravitational potential with modified gravity

(calculation goes here)

$$E_p = -\frac{GMm}{\epsilon}(\tan^{-1}(\frac{r}{\epsilon}) - \frac{\pi}{2}) \qquad (e \neq 0)$$

3 Results and analysis

3.1 ?

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4 Conclusion

What we learned:

- ?

4.1 Critique

- ?