Newtonian conservation of *energy*[1]
yields the *free fall velocity*: $\frac{1}{2}mv_{\mathrm{ff,N}}^2 - GMm/r = 0 \therefore v_{\mathrm{ff,N}}^2 = 2GM/r$

Centripetal acceleration
renders the *orbital velocity*: $v_{\mathrm{orb,N}}^2/r = F_{\mathrm{g}}/m = GM/r^2 \therefore v_{\mathrm{orb,N}}^2 = GM/r$

Schwarzschild radius: $r_{\mathrm{S}} \coloneqq 2GM/c^2$
$=$ minimal *periapsidal distance* r_{p} for any Keplerian/Newtonian hyperbolic trajectory with *periapsidal velocity*: $v_{\mathrm{p,N}} = c$
as well as distance where: $v_{\mathrm{ff,N}} = c$
As yet, there is no reason to call it an *event horizon*.

With: $\beta \coloneqq v/c$
and: $\rho \coloneqq r/r_{\mathrm{S}}$
we obtain: $\beta_{\mathrm{ff,N}}^2 = 1/\rho$
as well as: $\beta_{\mathrm{orb,N}}^2 = 1/2\rho$

Einsteinian *kinetic energy*: $E_{\mathrm{k}} = (\gamma - 1)mc^2$
& *total energy*: $E_{\mathrm{tot}} = \gamma mc^2 \therefore \gamma = E_{\mathrm{tot}}/mc^2$

The ***Lorentz factor*** is identically the same as the ***dimensionless specific energy***.

Newsteinian conservation of *energy*:

$$\boldsymbol{(\gamma_{\mathrm{ff,NS}} - 1)mc^2 + \frac{-GMm}{r} = 0}$$

renders: $\boldsymbol{\gamma_{\mathrm{ff,NS}}} = 1 + \frac{GM}{rc^2} = \boldsymbol{1 + \frac{1}{2\rho} = \frac{2\rho+1}{2\rho}}$

Contraction then is by: $\boldsymbol{1/\gamma_{\mathrm{ff,NS}} = 2\rho/(2\rho+1)}$

Taylor $@\rho = 0$: $1/\gamma_{\mathrm{ff,NS}} = 2\rho - 4\rho^2 + 8\rho^3 - 16\rho^4 + \mathcal{O}(\rho^5)$
(converges if $\rho < 1/2$)

Laurent $@\rho = \infty$: $1/\gamma_{\mathrm{ff,NS}} = 1 - \frac{1}{2\rho} + \frac{1}{4\rho^2} - \frac{1}{8\rho^3} + \frac{1}{16\rho^4} + \mathcal{O}\left(\frac{1}{\rho^5}\right)$
(converges if $\rho > 1/2$)

Contracted radius: $\boldsymbol{\varrho} = \frac{\rho}{\gamma} = \boldsymbol{\frac{2\rho^2}{2\rho+1}}$ (which I pronounce *crho*)

hence: $\boldsymbol{\rho = \frac{\varrho+\sqrt{\varrho(\varrho+2)}}{2}} = \boldsymbol{\varrho + \frac{1}{2}} - \frac{1}{4\varrho} + \frac{1}{4\varrho^2} - \frac{5}{16\varrho^3} + \mathcal{O}\left(\frac{1}{\varrho^4}\right)$ ($@\varrho = \infty$)

Gravitational length ***contraction*** does not exist. The locally measured $\boldsymbol{\varrho}$ is the true radius, which at great distance seems ***expanded*** to $\boldsymbol{\rho \approx \varrho + 1/2}$. But I'll keep using the term. It applies ***OF COURSE*** to ***any*** radial distance, no matter its end points. Obviously, this includes the *Schwarzschild radius*! Or can ***YOU*** ***deduce*** the opposite from ***ascertained truths***? *Why* should r_{S} be excluded from *length contraction* if it actually is something expanded? In Schwarzschild geometry, length contraction is by $\sqrt{1 - 2GM/rc^2} = \sqrt{1 - 1/\rho}$, which at $\rho = 1$, i.e. $r = r_{\mathrm{S}}$, **obviously** renders a remaining *radius* equal to *Sweet Fanny Adams*, so the thing is ***not*** a ***hole*** at all. There exists ***NO*** such entity as an *event horizon*. When you fall towards a very heavy mass along a "bull's eye trajectory",

---

[1] Newton himself had no idea of energy. Have ***YOU*** ever realised *energy* is a fully abstract quantity?

you'll simply smack against the damn thing at nearly the *speed of light* and then uh, well, then it will all be over. For you. **HAH hah** hah hah hah hah hah hah hah hah hah hah hah hah...

Free fall velocity: $$\boldsymbol{\beta^2_{\mathrm{ff,NS}}} = \frac{\gamma^2_{\mathrm{ff,NS}}-1}{\gamma^2_{\mathrm{ff,NS}}} = \boldsymbol{\frac{4\rho+1}{4\rho^2+4\rho+1}} = \boldsymbol{\frac{4\rho+1}{(2\rho+1)^2}}$$

In https://henk-reints.nl/astro/HR-general-relativity-and-black-holes.pdf (pp.27,53,68–70 as of 2024-08-11), the *effective radial potential energy*[2] using $\boldsymbol{\varrho}$ renders

the ***orbital velocity***: $$\boldsymbol{\beta^2_{\mathrm{orb,NS}}} = \boldsymbol{\frac{\rho+1}{2\rho^2+\rho+1}}$$

At $\rho = 1$:	$\beta_{\mathrm{ff,NS}}$	$= \frac{\sqrt{4\rho+1}}{2\rho+1}$	$= [\sqrt{5}/3 \approx 0.745]$	< 1
	$\beta_{\mathrm{orb,NS}}$	$= \sqrt{\frac{\rho+1}{2\rho^2+\rho+1}}$	$= [\sqrt{2}/2 \approx 0.707]$	$< \beta_{\mathrm{ff,NS}}$
at $\rho = 1/2$:	$\beta_{\mathrm{ff,NS}}$		$= [\sqrt{3}/2 \approx 0.866]$	< 1
	$\beta_{\mathrm{orb,NS}}$		$= [\sqrt{3}/2 \approx 0.866]$	$= \beta_{\mathrm{ff,NS}}$
at $\rho < 1/2$:	$1 > \beta_{\mathrm{orb,NS}}$			$> \beta_{\mathrm{ff,NS}}$
at $\rho = 0$:	$1 = \beta_{\mathrm{orb,NS}}$			$= \beta_{\mathrm{ff,NS}}$

IF you, like me, firmly ***reject*** the ~~rather silly~~ completely stupid idea of ***infinite density***, then $\rho = 0$ is unattainable, thus maintaining the uncome-at-ability of the very *speed of light*.

Within $\rho = 1/2$, we have $\beta_{\mathrm{orb,NS}} > \beta_{\mathrm{ff,NS}}$, which makes an orbiting body spiral ***OUT*** towards $\rho = 1/2$. This seems in full agreement with the derivation by Johannes Droste[3], although this *Newsteinian* ISCO resides at another *distance* from M (he found the "standard" ISCO at $\rho = 3$).

And then we've got: $$\gamma_{\mathrm{esc,NS}} = \gamma_{\mathrm{ff,NS}} = 1 + 1/2\rho$$
as a requirement for escaping to infinity if starting at a given *distance* from M .

> The concept of *escape velocity* only applies to masses & *not* to photons! It is ***incorrect*** to consider light's *escape velocity*, since it doesn't have any choice as far as its *velocity* is concerned. However, *escape energy* or *escape Lorentz factor* should apply to both.

Light: $$E_\gamma = h\nu = E_{\mathrm{k},\gamma} + E_{\mathrm{rest},\gamma}$$
Since it cannot be at rest, the *rest energy* term disappears, so we can equate E_γ to the photon's *kinetic energy* (cf. *radiation pressure*, where we essentially do the same),
i.e.: $$E_\gamma = (\gamma_\gamma - 1) m_\gamma c^2$$
where: $$m_\gamma \coloneqq E_\gamma / c^2 = h\nu / c^2$$
is the *relativistic mass* of a photon (it has no other; *rest mass* of a photon is a completely senseless concept since it cannot ever be at rest in whatever frame. Light distinguishes itself from matter by having a finite *relativistic mass* at the very *speed of light*).

Therefore: $$E_\gamma = (\gamma_\gamma - 1)(E_\gamma / c^2) c^2 \therefore \gamma_\gamma - 1 = 1 \therefore \boldsymbol{\gamma_\gamma = 2}$$

hence: **light** (i.e. a **photon**) has a frequency independent ***Lorentz factor*** of **2**.

***TWO*!** No more, no less! ***TWO*!**

Its "*rest*" *mass would* be: $$\boldsymbol{m_{0,\gamma}} = m_\gamma / \gamma_\gamma = h\nu / 2c^2 > \boldsymbol{0}$$ YES, non-zero!

Don't **zero** *rest energy* & **non-zero** *rest mass* imply/confirm photons *cannot* be at rest?

---

[2] https://en.wikipedia.org/wiki/Two-body_problem_in_general_relativity#Effective_radial_potential_energy

[3] KONINKLIJKE AKADEMIE VAN WETENSCHAPPEN TE AMSTERDAM. VERSLAG VAN DE GEWONE VERGADERING DER WIS- EN NATUURKUNDIGE AFDEELING VAN ZATERDAG 27 MEI 1916. DEEL XXV. N^0. 1. pp.163..180.

Photon's *specific energy*: $E_\gamma / m_\gamma = c^2$

Gravitational potential at r_S : $\Psi = -c^2/2$

Light has ***twice*** the **energy required** to climb out of the *potential* well at $\boldsymbol{r_S}$ **!**

Escape requirement: $\gamma_{\text{esc,NS}} = 1 + 1/2\rho$

Can ***YOU*** deduce from ascertained truths or properly substantiate otherwise that the very same would not apply to light?

We have/obtain: $\boldsymbol{\gamma_\gamma = 2} = 1 + 1/2\rho_{\text{esc},\gamma} \therefore \boldsymbol{\rho_{\text{esc},\gamma} = 1/2}$

i.e.: **light** can **escape** from anywhere outside ***half*** the ***Schwarzschild radius*!**

However, a ***mass*** can have ***any*** Lorentz factor $1 \le \gamma_{\text{m}} < \infty$, so it can escape from ***any*** distance as long as $\boldsymbol{\gamma_{\text{m}} \ge 1 + 1/2\rho}$, even if $\rho < 1/2$!

A black "hole" is only black if its *material radius* is less than *half* its *Schwarzschild radius* and this blackness only applies to light. ***Any*** massive object can escape from ***any*** non-zero *distance*, no matter how small, provided it has sufficient *energy*.

In https://henk-reints.nl/astro/HR-BH-temperature.pdf , the internal *temperature* of a black hole resulting from a gravitational collapse of a (very) large cloud is derived as:

$$T_{\text{BH}} = \frac{3mc^2}{25k_{\text{B}}}$$

where m is the *mass* of the "molecules" it consists of. The BH's *mass* itself disappeared from the equation. Using the atomic mass of hydrogen: $m \approx 1.008$ Da,

we obtain: $\boldsymbol{T_{\text{BH}} \approx 1.31 \times 10^{12}}$ **K** (cf. the *Hagedorn temperature*!)

At this *temperature*, molecules obviously have quite some *kinetic energy*. Plausibly, the thing can easily evaporate at its surface or whatever kind of border*ish* surrounding it may have. If it is smaller than $r_S/2$, it cannot radiate any *energy*, Annie, but let's see Kenny, can he condemn me to carry many heavy clouds? Yes, he friendly says he can, dear. Plenty. Around "our" SMBH[4], $T_{\text{SgrA}^*} \approx 4.25$ K $> T_{\text{CMB}} \approx 2.725$ K. Wouldn't this require some *heat* source? They[4] mention an "outflow velocity with $\gamma\beta = 1.5$", which via $T = 2E/3k_{\text{B}} = 2(\gamma - 1)mc^2/3k_{\text{B}}$ and $m = 1.008$ Da (atomic H) would correspond to $\sim 5.8 \times 10^{12}$ K, (but straight conversion of ballistic *kinetic energy* to a *temperature* is incorrect[5]).

A neutron's *diameter* slightly exceeds its *Compton wave length*.

With the *Compton volume*: $V_{\text{C}} \coloneqq \frac{4\pi}{3}\left(\frac{\lambda_{\text{C}}}{2}\right)^3 = \frac{\pi}{6}\left(\frac{h}{mc}\right)^3$

we find the *Compton density*: $\Omega_{\text{C}} \coloneqq m/V_{\text{C}} = \frac{6c^3m^4}{\pi h^3}$

For a neutron, this is: $\Omega_{\text{C},n} \approx 1.392 \times 10^{18}$ kg/m³

energy density: $P_{\text{C},n} \coloneqq \Omega_{\text{C},n}c^2 \approx 1.25 \times 10^{35}$ Pa

which equals the ***observed***[6] proton pressure.

[4] Chr. Brinkerink et al. Persistent time lags in light curves of Sagittarius A*: evidence of outflow. (2021) Appendix D. https://arxiv.org/abs/2107.13402

[5] https://henk-reints.nl/astro/HR-solar-corona.pdf

[6] Burkert, V.D., Elouadrhiri, L. & Girod, F.X. The pressure distribution inside the proton. Nature 557, 396-399 (2018). https://www.nature.com/articles/s41586-018-0060-z

Gravitational pressure at centre of spherical homogeneous incompressible fluid[7] at $\Omega_{\mathrm{C},n}$:

$$P_{\mathrm{g}} = \frac{3GM^2}{8\pi R^4} \therefore \boldsymbol{P_{\mathrm{g}}^3} = \frac{27G^3M^6}{512\pi^3R^{12}} = \frac{\pi G^3\Omega_{\mathrm{C},n}^4M^2}{6} = \frac{G^3 6^3 c^{12} m_n^{16}}{\pi^3 h^{12}} M^2$$

(3rd power avoids fractional exponents)

we equate P_{g}^3 to: $$P_{\mathrm{C},n}^3 = \Omega_{\mathrm{C},n}^3 c^6 = \frac{6^3 c^{15} m_n^{12}}{\pi^3 h^9}$$

yielding: $$M = \sqrt{\frac{c^3h^3}{G^3}}/m_n^2 \approx 5.78 \times 10^{31}\ \mathrm{kg} \approx 29M_\odot$$

For Newtonian *gravity* to overcome the repulsive *neutron Compton pressure* at the *neutron Compton density*, at least 29 solar masses of Compton neutronium are required.

Below this, ***gravity can certainly not crush neutrons.***

We easily find that the mass required to obtain a Newtonian *gravitational core pressure* equal to the *Schwarzschild pressure* is twice the BH's mass. Since this is Newtonian, it's plausible, but not "proven", a Schw. BH cannot ever collapse under its own gravity.

The lower the *density*, the more *mass* is needed to form a BH and less *mass* requires a greater *density*.

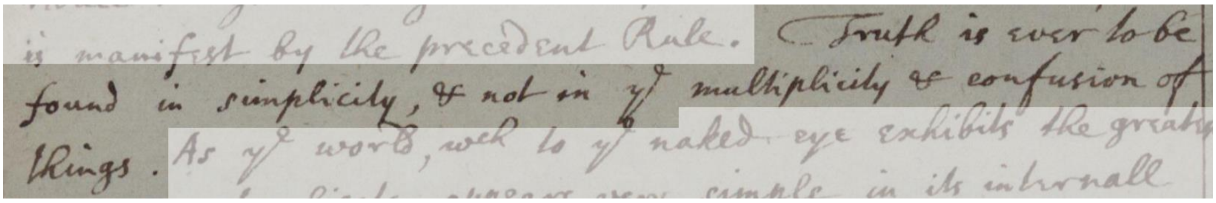
To my knowledge, neutrons have the greatest density ever measured (or do we *know* the size of all those very rapidly decaying other particles?) and then we can at least *use* $\Omega_{\mathrm{C},n}$ as an *upper density limit*, be it fundamental or not.

At $\Omega_{\mathrm{C},n}$, $10.3M_\odot$ just fits within $r_{\mathrm{S}}/2$, making it truly black, & $3.64M_\odot$ matches r_{S} .
Smaller masses must ***exceed*** said ***upper density limit*** in order to form a BH.

The lighter a mass, the heavier it must be in order to obtain sufficient *gravity* to squeeze it into its original *Schwarzschild volume*.

Mini, let alone micro BHs cannot exist, smart-arse!

Isaacus Newtonus: *Natura enim simplex est & nihil agit frustra*.
For nature is simple & does nothing in vain.


is manifest by the precedent Rule. Truth is ever to be found in simplicity, & not in ye multiplicity & confusion of things. As ye world, wch to ye naked eye exhibits the greatest

Truth is ever to be found in simplicity,
& not in the multiplicity & confusion of things.
Isaac Newton, Untitled Treatise on Revelation (section 1.1), Rule 9, folio 14r
https://www.nli.org.il/en/manuscripts/NNL_ALEPH990026832700205171//NLI#$FL9002307

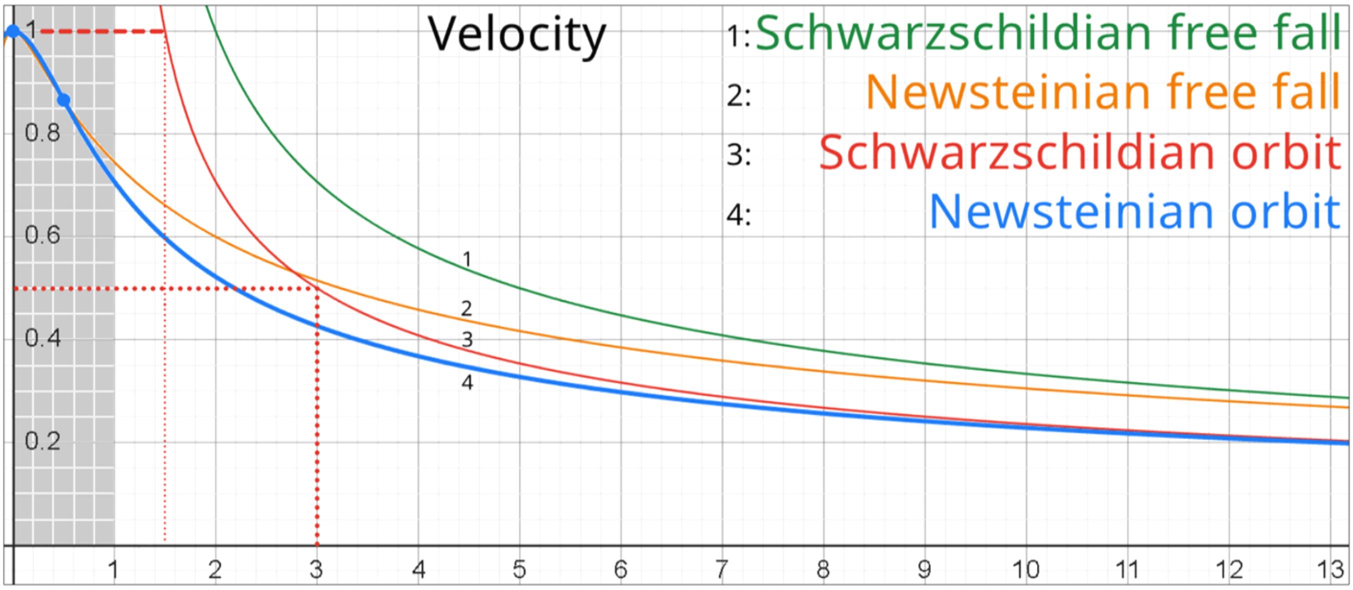
A ***singularity*** is a point where even maths does ***not*** render a solution.
Then how can one think it would be a *physical* reality?
Please return your grade(s) & diplomas and leave science!
Crotcheteer!

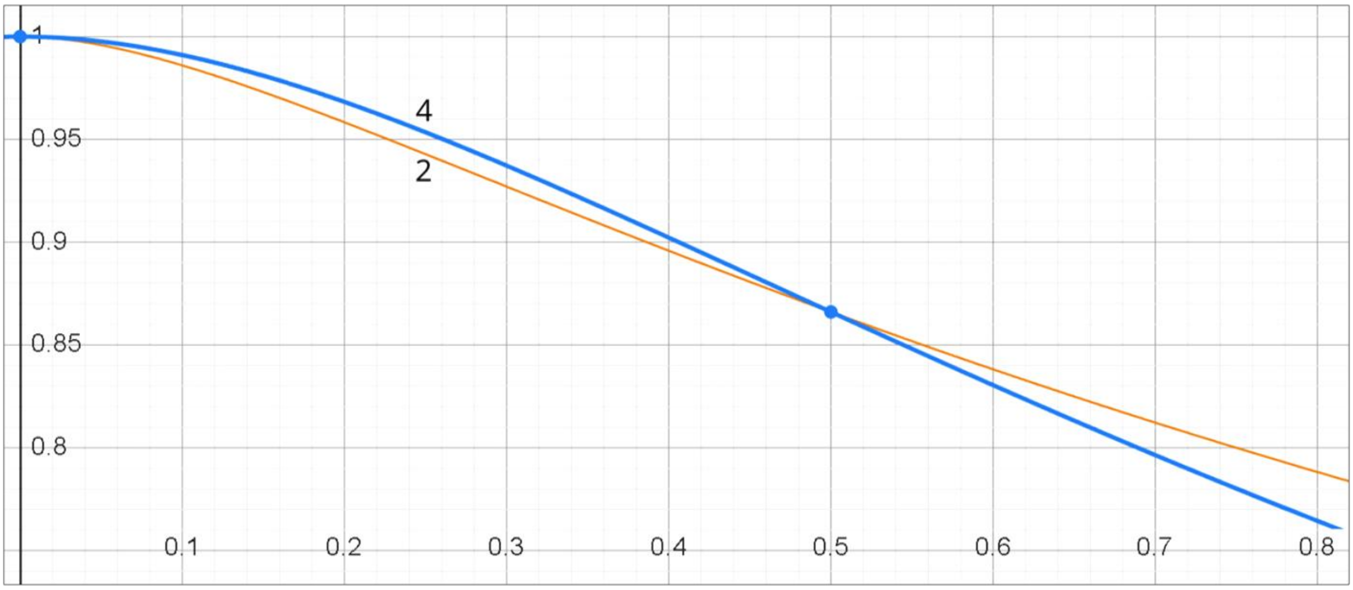
Ex fabricationibus sequitur castrum in cælum, stultorum paradisum.
From fabrications follows a castle in the air, the fool's paradise.

---

[7] According to Newton's spherical shell theorem, gravity should equal nought at the very centre, so I'm convinced this eqn. is wrong, see https://henk-reints.nl/HR-Gravitational-pressure-surface-tension.pdf , but right now, we only need an upper limit of Newtonian gravity, so we can safely use it.

Velocities





Schwarzschildian:	free fall:	$\beta = 1/\sqrt{\rho}$
	orbit:	$\beta = 1/\sqrt{2(\rho - 1)}$
	ISCO:	$\rho = 3$
	photon sphere:	$\rho = 3/2$
***Newsteinian*:**	**free fall:**	$\boldsymbol{\beta = \frac{\sqrt{4\rho+1}}{2\rho+1}}$
	orbit:	$\boldsymbol{\beta = \sqrt{\frac{\rho+1}{2\rho^2+\rho+1}}}$
	ISCO:	$\boldsymbol{\rho = 1/2}$
	photon sphere:	$\boldsymbol{\rho = 0}$

