$$u' = -\frac{3Rk}{c}F$$

$$F' = -\frac{F}{z} + Rck(u_p - u)$$

Если $z = 0$:

$$\lim_{z \to 0} \frac{F}{z} = \overset{(\text{неопр. } \frac{0}{0})}{\{\text{прав. Лопиталя}\}} = \lim_{z \to 0} \frac{\frac{dF}{dz}}{\underbrace{\frac{d}{dz} z}_{=1}} = \lim_{z \to 0} \frac{dF}{dz} = \frac{dF}{dz}$$

$$F' = \begin{cases} -\frac{F}{z} + Rck(u_p - u), & z \neq 0 \\ \frac{Rck}{2}(u_p - u), & \text{иначе} \end{cases}$$

$z = 0$, $F(0) = 0$

$z = 1$, $F(1) = 0.393\, c\, u(1)$

$$\begin{cases} F = -\dfrac{c}{3Rk(z)} u'_z \\ \dfrac{1}{Rz}(zF)'_z = ck(z)(u_p - u) \end{cases}$$

$\dfrac{du}{dz} = 0$

$\dfrac{du}{dz} =$

$\dfrac{du}{dz} =$

$\dfrac{dF}{dz} =$

$z = 0, \; F(0) = 0$

$z = 1, \; F(1) = 0393 c \, u(1)$

$\dfrac{1}{R} F' = ck(1)(u_p - u(1))$

$\dfrac{1}{R} \, 0393 \cancel{c} \, u'(1) = \cancel{c} k(1)(u_p - u(1))$

$$\frac{du}{dz} = \frac{k(1)(u_p - u(1))}{0397 \frac{1}{R}}$$

$F \to 0$

$\lim\limits_{\Delta z \to 0} \dfrac{\Delta F}{\Delta z} =$

$$\begin{cases} F = -\dfrac{c}{3Rk} u' \\ \dfrac{1}{Rz}(zF)' = ck(u_p - u) \end{cases}$$

$u' = -\dfrac{3Rk}{c} F$

$z' F + F' z = Rzck(u_p - u)$

$F + F'z = Rzck(u_p - u)$

$\dfrac{F}{z} + F' = Rck(u_p - u)$

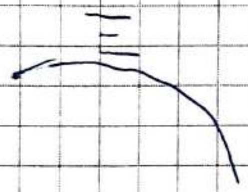
$F' = -\dfrac{F}{z} + Rck(u_p - u)$

Что делать при z равном 0?

$\lim\limits_{z \to 0} \dfrac{F_{\to 0}}{z_{\to 0}} = \lim\limits_{z \to 0} \dfrac{dF}{dz} = \dfrac{dF}{dz}$

$F(0) = 0$ $u(0) = ?$ $F(1) = 0.393\,c\,u(1)$

Из методы: Методу стрельбы по формуле: $u(0) = \xi u_p(0)$



$\xi = 10^{-2} \dots 1$

$\Psi(\xi) = F - 0.393\,c\,u(\xi)$

$\xi = \frac{\xi_1 + \xi_2}{2}$ $\left| \frac{\xi_1 - \xi_2}{\xi} \right| < \varepsilon$ $\varepsilon = 10^{-4}$

Принимаем:

$u(0) = \xi 10^{-2} u_p(0)$ ~~найти $u(x)$?~~ → ~~найти~~ $F(1)$

Решаем методом Рунге Кутта

Получаем: $u(1)$ и $F(1)$

~~Новое~~ Оценим: $F(1) = 0.393\,c\,u(1)$ →

$-\frac{\Delta X}{..} \geq 0.85 - 1$

$\frac{\Delta X}{..} \leq 0.15$

$\Delta X \leq 0.15(\varepsilon - M)$

$P\{X \leq \varepsilon\} \geq 0.85$

$1 - \frac{MX}{\varepsilon}$

в цикле:

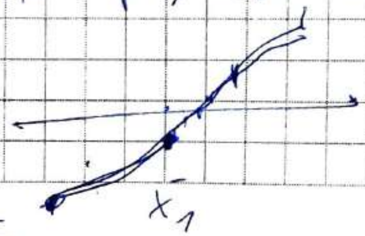
1) $\xi = 10^{-2} \dots 1$ (0.01) ищем промежуток со сменой знака

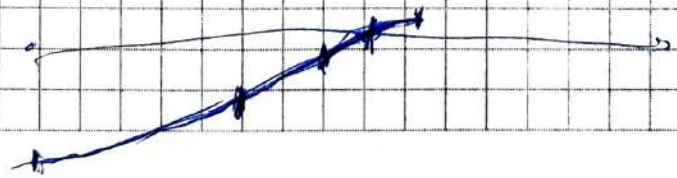
2) Уточним корень $\Psi(\xi)$ в найденном промежутке

* F и U – с помощью РК.

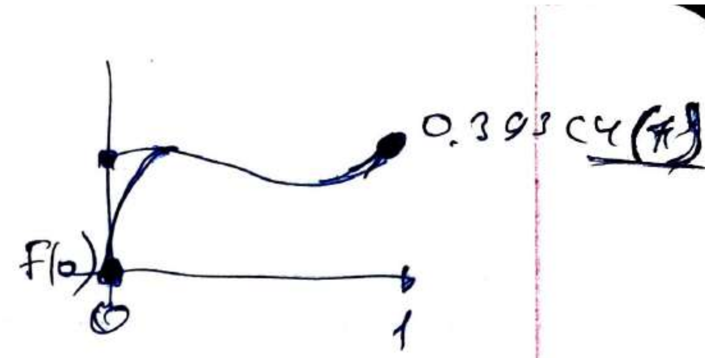
MX $p \geq 0.85$ σ^2 $n = 365$

$P\{X \leq \varepsilon\}$





$F(1) = 0.393\, c\, u(1)$



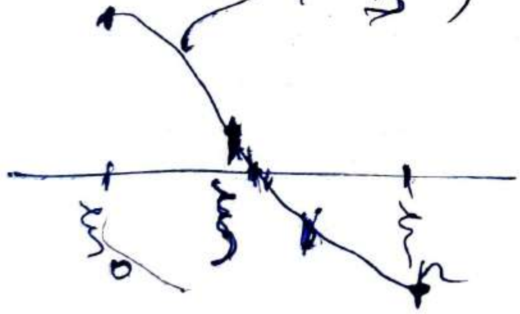
$F(0)$ $u(0)$

$$\overbrace{F - \frac{mc}{2} u}^{\psi(\xi)} = 0$$

$\xi = 1e-2 \dots 1$

$m = 0.78$

$\varepsilon \leq 1e-4$



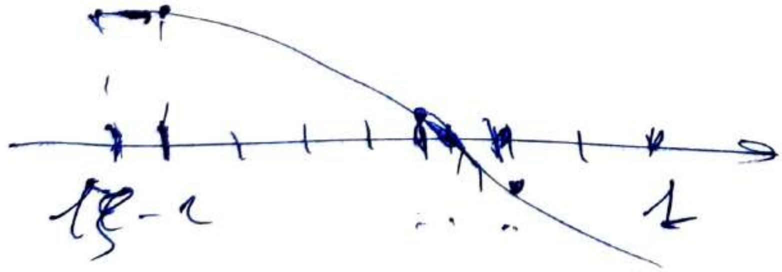
$F(0)$

$u(0) = u_p(0)$

Rla.. F u

[...] [...]

F[-1] u[-1]



$u'(0) = 0$

$u'(1) = cu$

$u'(0) = 0$

$u'(1) - cu = 0$

$$u = u_0(x) + \sum_{i=1}^{n} C_i\, u_i(x)$$

$u_0'(0) = 0$

$u_0'(1) = u$.

$\underline{u_0 = f(x)}$

№3 Неявный метод Эйлера.

$$\begin{cases} \dfrac{du}{dz} = -\dfrac{3Rk}{c}F \\ \dfrac{dF}{dz} = -\dfrac{F}{z} + Rck(u_p - u) \end{cases}$$

$$\begin{cases} \dfrac{u_{n+1} - u_n}{h} = -\dfrac{3Rk(z_{n+1})}{c}F_{n+1} \\ \dfrac{F_{n+1} - F_n}{h} = -\dfrac{F_{n+1}}{z_{n+1}} + Rck(z_{n+1})(u_p(z_{n+1}) - u_{n+1}) \end{cases}$$

$$\begin{cases} u_{n+1} = u_n - h\dfrac{3Rk(z_{n+1})}{c}F_{n+1} \\ F_{n+1} = F_n + h\left(-\dfrac{F_{n+1}}{z_{n+1}} + Rck(z_{n+1})(u_p(z_{n+1}) - u_{n+1})\right) \end{cases}$$

$$\begin{cases} u_{n+1} = u_n - \dfrac{3Rk(z_{n+1})h}{c}F_{n+1} \\ F_{n+1} = F_n + h\left(-\dfrac{F_{n+1}}{z_{n+1}} + Rck(z_{n+1})\left(u_p(z_{n+1}) - u_n + \dfrac{3Rk(z_{n+1})h}{c}F_{n+1}\right)\right) \end{cases}$$

№4 Метод трапеций (неявный)

$$\begin{cases} \dfrac{du}{dz} = -\dfrac{3Rk}{c}F = \varphi(z, F) \\ \dfrac{dF}{dz} = -\dfrac{F}{z} + Rck(u_p - u) = \psi(z, F, u) \end{cases}$$

$$\begin{cases} u_{n+1} = u_n + \dfrac{h}{2}\left(\varphi(z_n, F_n) + \varphi(z_{n+1}, F_{n+1})\right) \\ F_{n+1} = F_n + \dfrac{h}{2}\left(\psi(z_n, F_n, u_n) + \psi(z_{n+1}, F_{n+1}, u_{n+1})\right) \end{cases}$$

$$\begin{cases} u_{n+1} = u_n - \dfrac{3R}{c}\dfrac{h}{2}\left(k(z_n)F_n + k(z_{n+1})F_{n+1}\right) \\ F_{n+1} = F_n + \dfrac{h}{2}\left(-\dfrac{F_n}{z_n} + Rck(z_n)(u_p(z_n) - u_n) - \dfrac{F_{n+1}}{z_{n+1}} + Rck(z_{n+1})(u_p(z_{n+1}) - u_{n+1})\right) \end{cases}$$

№4

$$\begin{cases} u_{n+1} = u_n - \frac{3R}{c}\frac{h}{2}\left(k(z_n)F_n + k(z_{n+1})F_{n+1}\right) \\ F_{n+1} = F_n + \frac{h}{2}\left(-\left(\frac{F_n}{z_n} + \frac{F_{n+1}}{z_{n+1}}\right) + Rc\left(k(z_n)(u_p(z_n) - u_n) + \right.\right. \\ \qquad \left.\left. + k(z_{n+1})(u_p(z_{n+1}) + u_{n+1})\right)\right) \end{cases}$$

$$\begin{cases} u_{n+1} = u_n - \frac{3R}{c}\frac{h}{2}\left(k(z_n)F_n + k(z_{n+1})F_{n+1}\right) \\ F_{n+1} = F_n + \frac{h}{2}\left(-\left(\frac{F_n}{z_n} + \frac{F_{n+1}}{z_{n+1}}\right) + Rc\left(k(z_n)(u_p(z_n) - u_n) + k(z_{n+1})\left(u_p(z_{n+1}) + \right.\right.\right. \\ \qquad \left.\left.\left. + u_n - \frac{3R}{c}\frac{h}{2}\left(k(z_n)F_n + k(z_{n+1})F_{n+1}\right)\right)\right)\right) \end{cases}$$