Dieting Model:

Dieting is now days a concern to many individuals in which they practice the intake of food in a regulated way to prevent and treat diseases and to maintain body mass.

So our aim here is to construct a mathematical model of dieting process and investigate the properties of its solutions. The main significance of the model is to provides important insights and guides to a biomedical issue that is of interest to the general public.

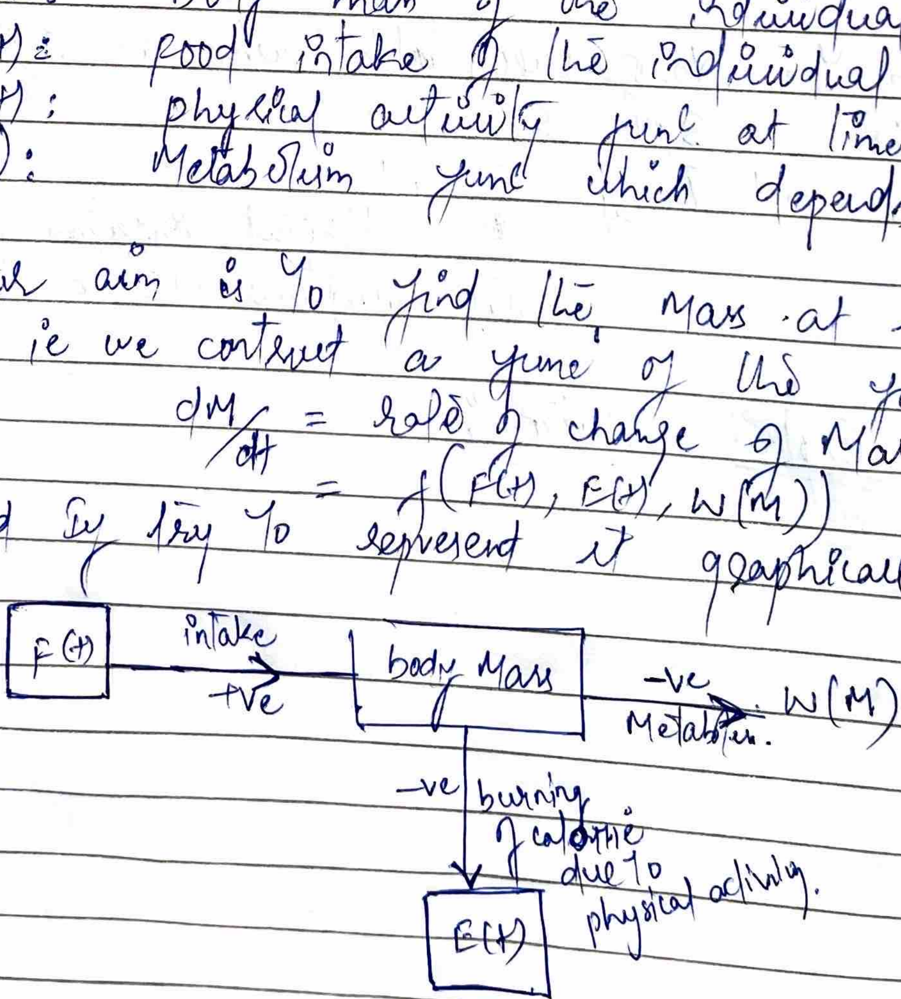
~~First~~. To start with model we have to make some assumptions as below,

$M(t)$: body mass of the individual at time t
$F(t)$: food intake of the individual at time t.
$E(t)$: physical activity func at time t.
$W(M)$: Metabolism func which depends on $M(t)$.

Our aim is to find the Mass at time t.
ie we construct a func of the form

$$\frac{dM}{dt} = \text{rate of change of Mass w.r.to time}$$
$$= f(F(t), E(t), W(M))$$

and we try to represent it graphically then



Thus dM/dt can be written as

$$dM/dt = F(t) - E(t) - W(M) \quad \text{--- (I)}$$

where $W(M) \propto M^{3/4}$ for our case.

i.e $W(M) = \beta M^{3/4}$, ~~as~~ β is a +ve constant.

$\therefore$ (I) becomes

$$\boxed{dM/dt = F(t) - E(t) - \beta M^{3/4}} \rightarrow \text{(II)}$$

Simplication Condition:

The main Issue is what are $F(t)$ and $E(t)$, as we have to consumed fixed quantity of calories in a Dieting within some fixed interval of time. i.e The intake of food is fixed in a day, $F(t)$ is fixed say $\bar{F}$. and Also in a Dieting the Physical activity is done with a target to ~~lost~~ burn some fixed value of calories. within the to say $E(t)$ is fixed as $\bar{E}$ in a day.

Then the result value of $[F(t) - E(t)]$ is

$$[F(t) - E(t)]_{average} = \bar{F} - \bar{E} = \lambda \text{ (say)} = \text{constant}$$

where λ is the average value of energy (calories) needed for an Individual under normal Dieting circumstances.

Now eq (II) becomes

$$dM/dt = F(t) - E(t) - \beta M^{3/4} = \lambda - \beta M^{3/4}$$

Time Scale: Here we try to find the number of days required for an individual to make an significante changes in their body-mass.

and we denote this parameter as T^* with
$$T^* = c\lambda^a \beta^b, \quad c = \text{constant}$$
where a & b are constants to be determined.

Now by $[M] = \#$ i.e. the physical unit of Mass is "#", Then

physical unit of $\lambda = [\lambda] = \frac{\#}{T}$ = Mass per time and

physical unit of $\beta = [\beta] = \frac{\#^{1/4}}{T}$, for T = Time unit.

Thus $T^* = c\lambda^a\beta^b \Rightarrow [T^*] = [c][\lambda]^a[\beta]^b$
$$T = 1\left(\frac{\#}{T}\right)^a\left(\frac{\#^{1/4}}{T}\right)^b$$
$$\Rightarrow T = \frac{\#^{a+b/4}}{T^{a-b}} \Rightarrow T = \#^{a+b/4}\, T^{-a-b}$$

Comparing LHS & RHS, we have
$$a + b/4 = 0 \quad \& \quad -a-b = 1$$
solving for a & b we get $a = 1/3$ & $b = -4/3$

i.e. $\boxed{T^* = \frac{\lambda^{1/3}}{\beta^{4/3}}}$ by choosing $c = 1$.