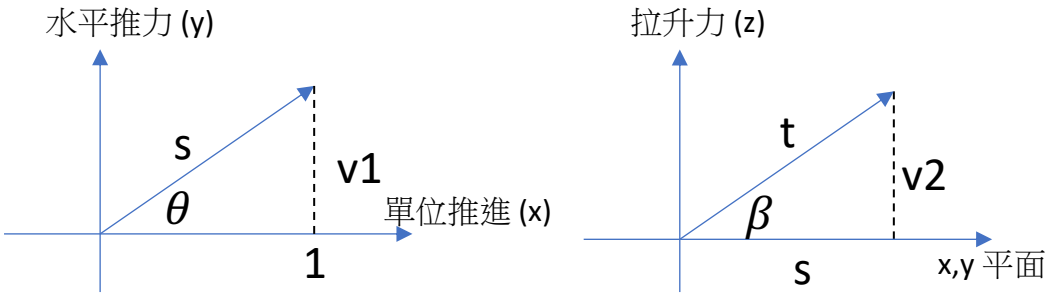
問題 2 – 無人戰機 (Unmanned Fighter)

(5 分)

問題敍述

為了保障一直被侵擾的領空並避免戰機飛行員的折損，需要委託你協助設計具有區域競爭力的無人戰機，依據今年友邦的經驗無人戰機在 9G 離心力的纏鬥下能輕易戰勝人類駕駛，因此需要你寫一個程式計算螺旋飛行 (Spiral) 在單位推進 (x) 下平移 (y) 和拉升 (z) 的可讓戰機往前進的速度 (t) 及水平傾斜的角度 (theta) 和上升傾斜的角度 (beta)。

主要公式與原理如下:



相關數學計算:

$\theta : theta$	$\beta : beta$
$\tan(\theta) = \frac{v1}{1} => \theta = \tan^{-1}\left(\frac{v1}{1}\right)$	$\tan(\beta) = \frac{v2}{s} => \beta = \tan^{-1}\left(\frac{v2}{s}\right)$
$\sin(\theta) = \frac{v1}{s} => v1 = s * sin(\theta)$	$\sin(\beta) = \frac{v2}{t} => v2 = t * sin(\beta)$
$\cos(\theta) = \frac{1}{s} => 1 = s * \cos(\theta)$	$\cos(\beta) = \frac{s}{t} => s = t * \cos(\beta)$
$s = \sqrt{v1^2 + 1^2} => v1 = \sqrt{s^2 - 1^2}$	$t = \sqrt{s^2 + v2^2} => v2 = \sqrt{t^2 - s^2}$
$\theta_{new} = \theta_{old} + \theta_{update}$	$\beta_{new} = \beta_{old} + \beta_{update}$

輸入 v1, v2, theta 修正值, beta 修正值。要回傳 t 值和新的 v1, v2 值。

輸入格式

v1,v2,theta 修正值, beta 修正值，中間以逗號隔開。

輸出格式

輸出 t, new_v1,new_v2 的值，四捨五入到小數第二位。

資料範圍

0.00 <= v1, v2 <=10.00,
0.01 <= theta adjustment, beta adjustment <= 0.10

輸入範例 1

```
3.00,2.00,0.01,0.02
```

輸出範例 1

3.74,2.97,2.06

範例 1 說明

V1= 3.0, v2=2.0,

$\theta = \tan^{-1}(\frac{3.0}{1})$, s = $\sqrt{3^2 + 1^2} = \sqrt{10}$, $\beta = \tan^{-1}(\frac{2.0}{\sqrt{10}})$,

t = $\sqrt{2.0^2 + \sqrt{10}^2} = \sqrt{14}$

$\theta_{new} = \tan^{-1}\left(\frac{3.0}{1}\right) + 0.01,$

$\beta_{new} = \tan^{-1}\left(\frac{2.0}{s}\right) + 0.02$

$v2_{new} = \sqrt{14} * \sin(\beta_{new})$

$S_{new} = \sqrt{14} * \cos(\beta_{new})$

$v1_{new} = S_{new} * \sin(\theta_{new})$

輸入範例 2

```
3.10,2.10,0.02,0.01
```

輸出範例 2

```
3.88,3.10,2.13
```

輸入範例 3

```
2.10,2.10,0.02,0.02
```

輸出範例 3

```
3.13,2.08,2.15
```

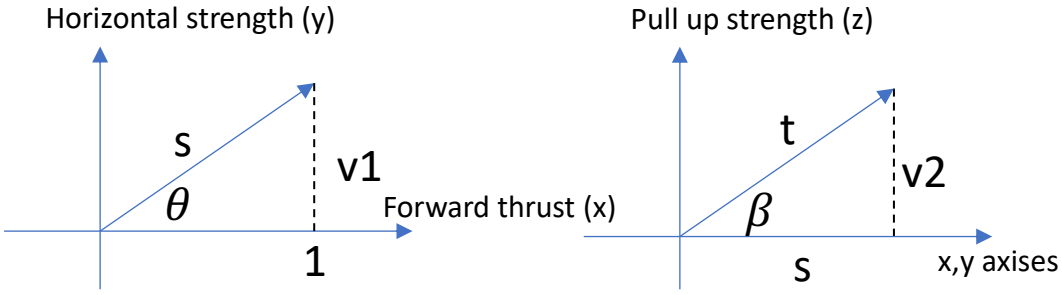
Q2: Unmanned Fighter

(5 points)

Description

To protect our airspace and save pilot's life, we need your help design an unmanned fighter which has strength in the region. Based on alliance's information from early this year, unmanned fighter can beat manned fighter easily in 9G circumstances. So, we need the program able to calculate spiral speed (t) and horizontal angle (theta) and pull up angle(beta) with given the unit thrust (as x-axis), for horizontal tilt (as y-axis), and pull up (z-axis) strength.

Related formula:



Related computation:

$\theta : theta$	$\beta : beta$
$\tan(\theta) = \frac{v1}{1} => \theta = \tan^{-1}\left(\frac{v1}{1}\right)$	$\tan(\beta) = \frac{v2}{s} => \beta = \tan^{-1}\left(\frac{v2}{s}\right)$
$\sin(\theta) = \frac{v1}{s} => v1 = s * sin(\theta)$	$\sin(\beta) = \frac{v2}{t} => v2 = t * sin(\beta)$
$\cos(\theta) = \frac{1}{s} => 1 = s * \cos(\theta)$	$\cos(\beta) = \frac{s}{t} => s = t * \cos(\beta)$
$s = \sqrt{v1^2 + 1^2} => v1 = \sqrt{s^2 - 1^2}$	$t = \sqrt{s^2 + v2^2} => v2 = \sqrt{t^2 - s^2}$
$\theta_{new} = \theta_{old} + \theta_{update}$	$\beta_{new} = \beta_{old} + \beta_{update}$

Input v1, v2, theta adjustment, beta adjustment, and output the (speed) t value and new v1 and new v2.

Input Format

v1,v2,theta adjustment, beta adjustment with comma separated.

Output Format

t,new_v1,new_v2
calculate the value and round to the second decimal place.

Data Range

0.0 <= v1, v2 <=10.00
0.01 <= theta adjustment, beta adjustment <= 0.10

1st Input Example

```
3.00,2.00,0.01,0.02
```

1st Output Example

3.74,2.97,2.06

1st Example Explanation:

v1= 3.0, v2=2.0,

$\theta = \tan^{-1}(\frac{3.0}{1})$, s = $\sqrt{3^2 + 1^2} = \sqrt{10}$, $\beta = \tan^{-1}(\frac{2.0}{\sqrt{10}})$,

t = $\sqrt{2.0^2 + \sqrt{10}^2} = \sqrt{14}$

$\theta_{new} = \tan^{-1}\left(\frac{3.0}{1}\right) + 0.01,$

$\beta_{new} = \tan^{-1}\left(\frac{2.0}{s}\right) + 0.02$

$v2_{new} = \sqrt{14} * \sin(\beta_{new})$

$S_{new} = \sqrt{14} * \cos(\beta_{new})$

$v1_{new} = S_{new} * \sin(\theta_{new})$

2nd Input Example

```
3.10,2.10,0.02,0.01
```

2nd Output Example

```
3.88,3.10,2.13
```

3rd Input Example

```
2.10,2.10,0.02,0.02
```

3rd Output Example

```
3.13,2.08,2.15
```