Point A is moving along the circle with center at point O_1 and radius O_1A with constant angular velocity $\omega = 2$

So, motion law for point A will be the following:

$$A = \begin{bmatrix} O_1A\cos(\omega t + \varphi) \\ O_1A\sin(\omega t + \varphi) \end{bmatrix},$$

considering O_1 as an center of coordinates $(0,0)$, and φ as initial angle at time $t=0$.

$\omega(O; r)$ – circle with center at point O and radius r

Motion law for point B can be found as an intersection of $\omega(O_1, O_1A)$ and axis OY. In code part of the solution I used intersection method from sympy.

Motion law for point C can be found after we found points A and B:

$$C = A + \frac{AC}{AB} \cdot (B - A) = A + \frac{AB - BC}{AB} \cdot (B - A)$$

Motion law for point D can be found as an intersection of $\omega(A, AD)$ and $\omega(O_2, O_2D)$. Such intersection may be represented as a system of such equations:

$$\begin{cases} (x_D - x_A)^2 + (y_D - y_A)^2 = AD^2, \\ (x_D - x_{O_2})^2 + (y_D - y_{O_2})^2 = O_2D^2; \end{cases}$$

All such systems were solved using solve() function from sympy library

Motion law for point E can be found as intersection of $\omega(D, DE)$ and $\omega(O_3, O_3E)$. This can be represented as a system of equations and solved similarly to the point D.

Motion law for point F can be found after we found points D and E:

$$F = D + \frac{DF}{DE} \cdot (E - D)$$

Similarly to point D we can find G as an intersection of $\omega(O_4, O_4G)$ and $\omega(F, FG)$, find H as an intersection of $\omega(F, FH)$ and $\omega(G, GH)$

However, since we do not need to find Velocities and accelerations of points G and H, I found them numerically.

Velocities and ~~total~~ accelerations for all points were found as first (for velocity) and second (for acceleration) derivative of motion law.

Tangential acceleration and normall acceleration for each point were found by such formulas:

$$\overline{a_i^\tau} = \underbrace{\frac{\overline{\vartheta_i}}{|\vartheta_i|}}_{\text{unit vector of direction}} \cdot \underbrace{\frac{(\overline{a_i} \cdot \overline{\vartheta_i})}{|\vartheta_i|}}_{\text{magnitude}}$$

$$\overline{a_i^n} = \overline{a_i} - \overline{a_i^\tau}$$

For finding angular velocity for some Link XY we can use such formulas:

$$\vec{\vartheta}_X(t) = \vec{\vartheta}_Y(t) + \bar{\omega}_{XY}(t) \times \bar{r}_{XY}(t)$$

Velocity of point X — Velocity of point Y — angular velocity of Link XY

From this we can obtain:

$$\boxed{\omega = \frac{|\bar{\vartheta}_X(t) - \bar{\vartheta}_Y(t)|}{|r_{O_1A}(t)|}}$$

Since we have found Velocities for points A, B, D, E, and velocities of points O_1, O_2, O_3, O_4 are 0 (points do not move), we can found angular velocities for links O_1A, AB, AD, O_2D, DE using formula above.

However, we did not found velocity of points G and H, we know only numerical solution of their positions. In addition, I want to notice that GHF is a fixed triangle, so angular velocities for links GH, HF, GF will be the same. Therefore, to find angular velocities for reamaning links (GH, HF, GF, O_4G) we only need to find velocity of point G. We will do it numerically: $\vartheta_G = \frac{G(t+dt) - G(t)}{dt}$ for some small dt.

After we found ϑ_G we will use the same formula as for other links, to find angular velocities.