16.12)

$time = [15, 45, 75, 105, 135, 165, 225, 255, 285, 315, 345]$

$T = [3.9, 4.2, 8.5, 11.2, 16, 18.7, 19.2, 17.1, 12.2, 7.2, 5.1]$

$\omega_0 = 2\pi / T = 2\pi / 365 \approx 0.0172$

$$\begin{bmatrix} N & \sum \cos(\omega_0 t) & \sum \sin(\omega_0 t) \\ \sum \cos(\omega_0 t) & \sum \cos^2(\omega_0 t) & \sum (\cos(\omega_0 t)\sin(\omega_0 t)) \\ \sum \sin(\omega_0 t) & \sum \cos(\omega_0 t)\sin(\omega_0 t) & \sum \sin^2(\omega_0 t) \end{bmatrix} \begin{bmatrix} A_0 \\ A_1 \\ B_1 \end{bmatrix}$$

$$= \begin{bmatrix} \sum y \\ \sum y \cos(\omega_0 t) \\ \sum y \sin(\omega_0 t) \end{bmatrix}$$

$\vec{a} = [12.0341, -8.1724, -2.1156]$

$C = \sqrt{a_1^2 + a_2^2} = 8.44195$

$y = 12.0341 + -8.1724 \cos(\omega_0 t) + -2.1156 \sin(\omega_0 t)$

$y' = 8.1724 \sin(\omega_0 t) - 2.1156 \cos(\omega_0 t) = 0$

$\frac{\sin(\omega_0 t)}{\cos(\omega_0 t)} = \frac{8.1724\,\omega_0}{2.1156\,\omega_0}$

time max $= 184$ days

found using matlab