

תרגיל 2

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שאלה 1

1.

$$\vec{x}(t) = (R_0 + A \cos(4\omega t)) \hat{r}$$

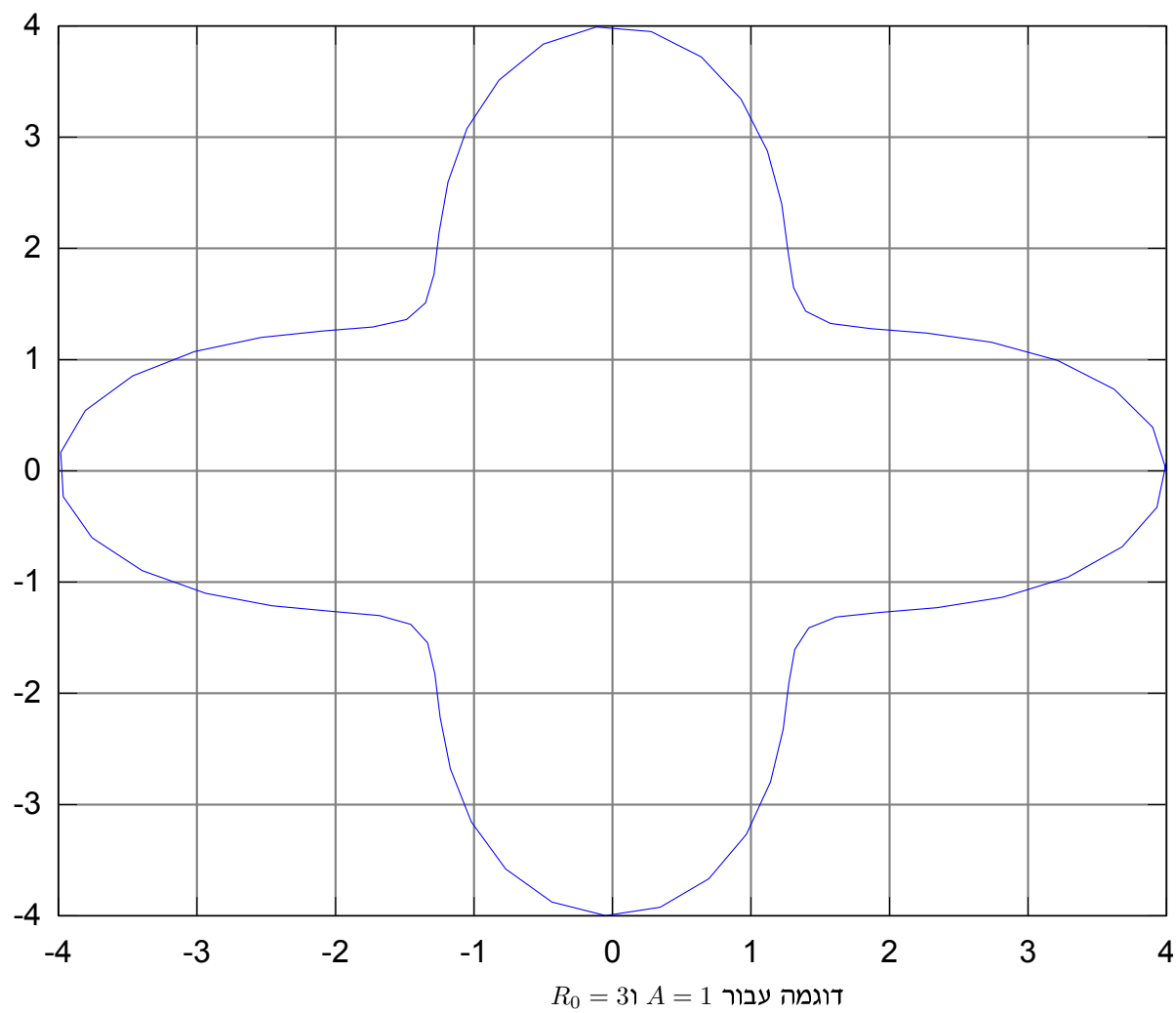
2.

$$\begin{aligned} \frac{\partial}{\partial t} \vec{x}(t) &= \frac{\partial}{\partial t} (R_0 + A \cos(4\omega t)) \hat{r} \\ &= \frac{\partial}{\partial t} (R_0 + A \cos(4\omega t)) \hat{r} + (R_0 + A \cos(4\omega t)) \frac{\partial}{\partial t} \hat{r} \\ &= -4\omega A \sin(4\omega t) \hat{r} + (R_0 + A \cos(4\omega t)) \dot{\theta} \hat{\theta} \\ &\quad - 4\omega A \sin(4\omega t) \hat{r} + (R_0 + A \cos(4\omega t)) \omega \hat{\theta} \end{aligned}$$

3.

$$\begin{aligned} \frac{\partial^2}{\partial t^2} \vec{x}(t) &= \ddot{R} \hat{r} + \dot{R} \dot{\theta} \hat{\theta} + \dot{R} \dot{\theta} \hat{\theta} + R \ddot{\theta} \hat{\theta} + R \dot{\theta}^2 \hat{r} \\ &= \frac{\partial}{\partial t} (-4A\omega \sin(4\omega t)) \hat{r} + (-4A\omega \sin(\omega t) \cdot \omega) \hat{\theta} + (R_0 + A \cos(4\omega t)) \cdot 0 \hat{\theta} + (R_0 + A \cos(4\omega t)) \omega^2 \hat{r} \\ &= -16A\omega \cos(4\omega t) \hat{r} - 4A\omega^2 \sin(\omega t) \hat{\theta} + (R_0 + A \cos(4\omega t)) \omega^2 \hat{r} \end{aligned}$$

4. תנועה מעגלית שהרדיוס שלה משתנה, ההפרש בין r_{min} ו r_{max} הוא $2A$



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$$\vec{x}(t) = (R_0 + A \cos(4\omega t)) \cdot \cos(\omega t) \hat{x} + (R_0 + A \cos(4\omega t)) \cdot \sin(\omega t) \hat{y}$$

שאלה 2

$$\begin{aligned}
 (F \sin \alpha - f - mg \sin \alpha) \hat{x} + (N - mg \cos \alpha) \hat{y} &= \vec{0} \\
 \begin{pmatrix} F \sin \alpha - f - mg \sin \alpha \\ N - mg \cos \alpha \end{pmatrix} &= 0 \\
 \begin{pmatrix} f \\ N \end{pmatrix} &= \begin{pmatrix} mg \sin \alpha - F \sin \alpha \\ mg \cos \alpha \end{pmatrix} \\
 \mu N &= mg \sin \alpha - F \sin \alpha \\
 \mu mg \cos \alpha &= mg \sin \alpha - F \sin \alpha \\
 \mu &= \frac{mg \sin \alpha - F \sin \alpha}{mg \cos \alpha}
 \end{aligned}$$

שאלה 3

$$\begin{aligned}
 T &= m\omega^2 R \\
 400 &= 5\omega^2 \cdot 0.5 \\
 \omega^2 &= 160 \\
 \omega &= 12.64 \frac{1}{sec} \\
 v &= \omega R \\
 &= 12.64 \cdot 0.5 \\
 &= 6.324 \frac{m}{sec}
 \end{aligned}$$