PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Phase space diagrams - CSIR NET Physics PYQs

Classical Mechanics . All PYQs (2015-2025) with answer key

7 questions . Answer key included

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Q1. [June 2015] . 5.0 marks

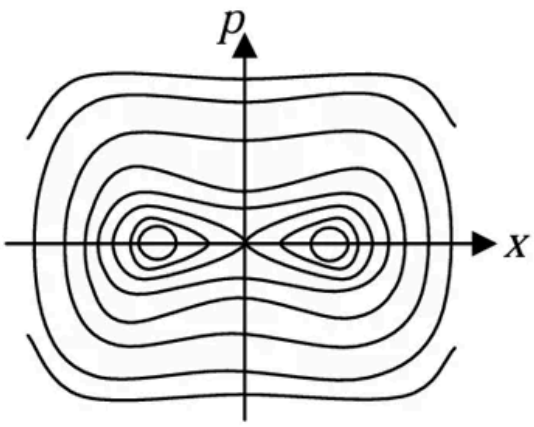
Classical Mechanics > Phase space diagrams

CSIR NET	2015 June	5 M

Which of the following figures is a schematic representation of the phase space trajectories (i.e., contours of constant energy) of a particle moving in a one-dimensional potential

$$V(x) = -\frac{1}{2}x^2 + \frac{1}{4}x^4?$$

1.



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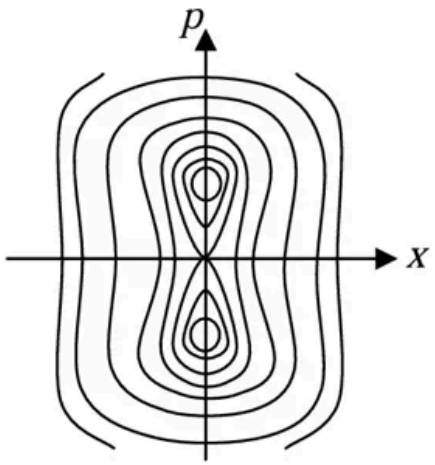

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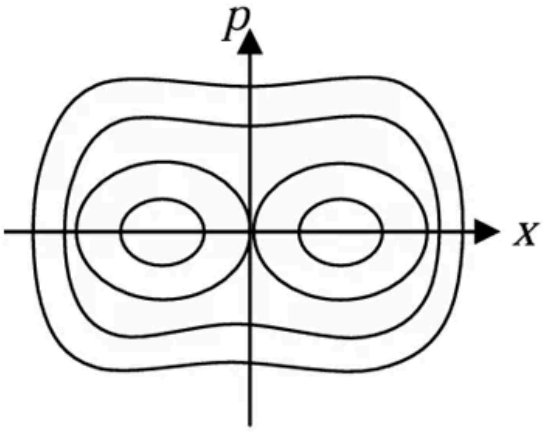

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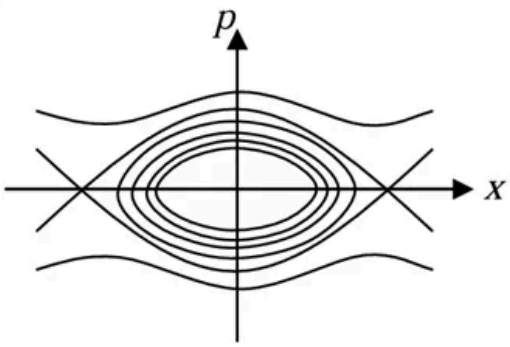


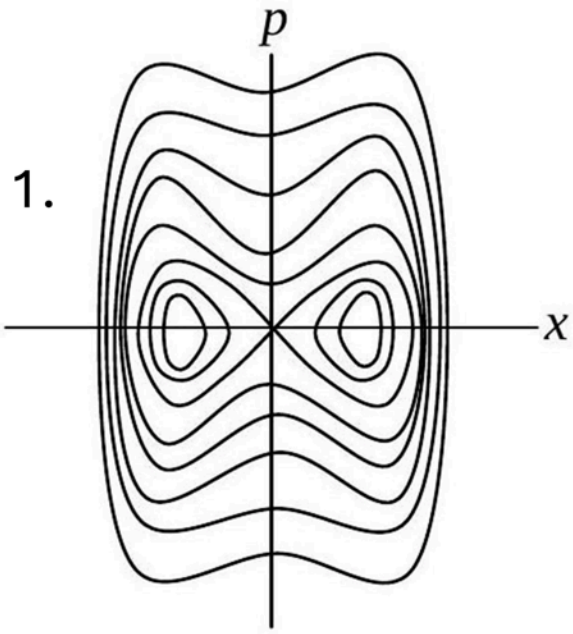
Q2. [Dec 2017] . 5.0 marks

Classical Mechanics > Phase space diagrams

CSIR NET	2017 Dec	5M

A particle moves in one dimension in a potential $V(x) = -k^2x^4 + \omega^2x^2$ where k and ω are constants. Which of the following curves best describes the trajectories of this system in phase space?

1.



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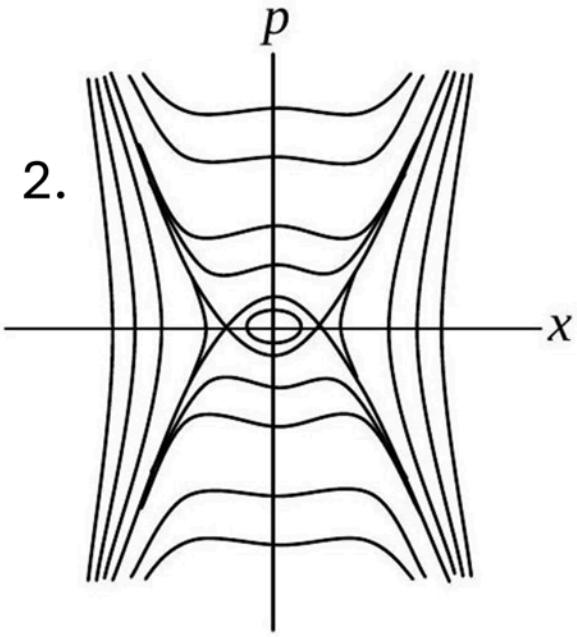

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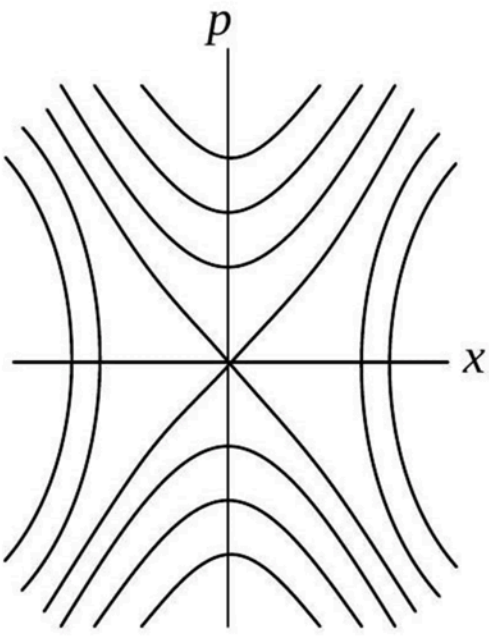

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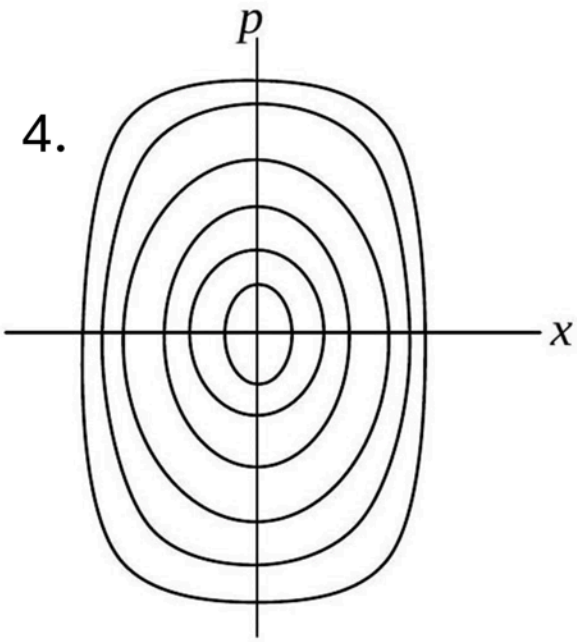
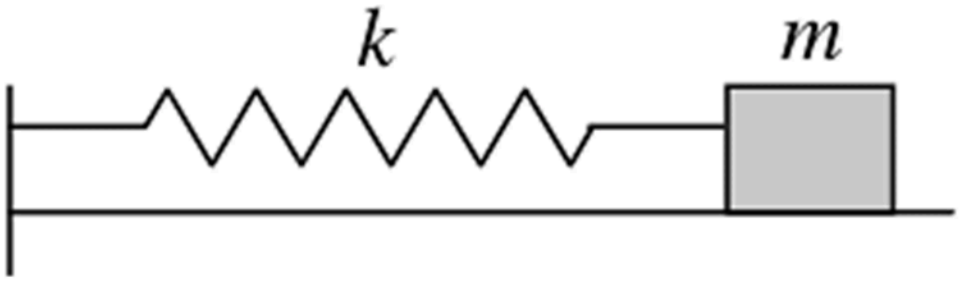


Q3. [Dec 2019] . 3.5 marks

Classical Mechanics > Phase space diagrams

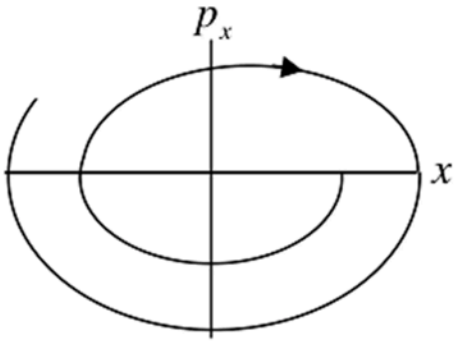
CSIR NET	2019 Dec	3.5M

A block of mass m, attached to a spring, oscillates horizontally on a surface. The coefficient of friction between the block and the surface is μ.



Which of the following trajectories best describes the motion of the block in the phase space (xp_x-plane)?

1.



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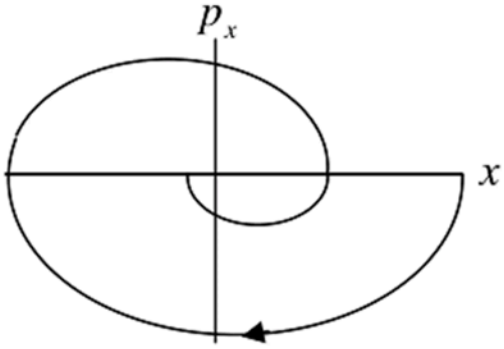

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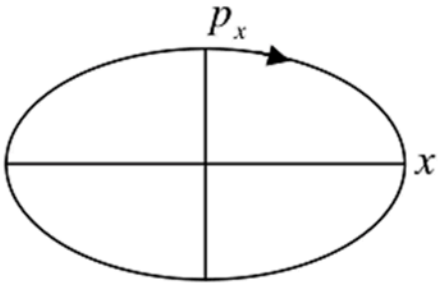

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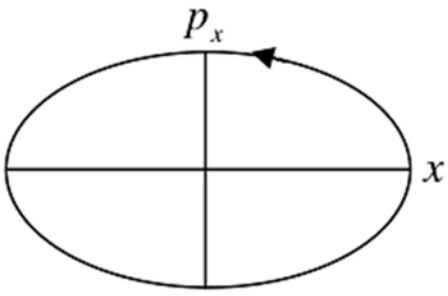
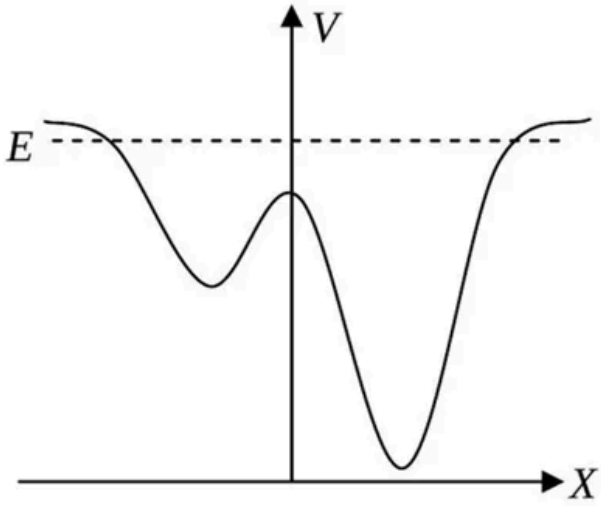


Q4. [June 2020] . 5.0 marks

Classical Mechanics > Phase space diagrams

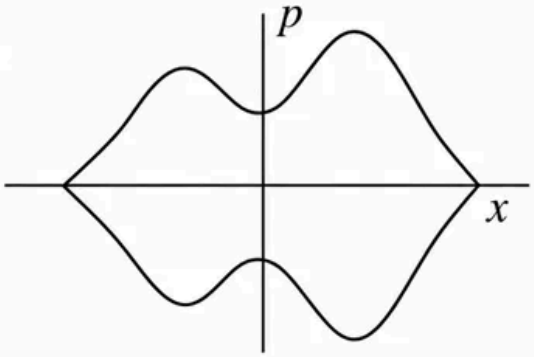
CSIR NET	2020 June	5M

Consider a particle with total energy E moving in one dimension in a potential $V(x)$ as shown in the figure below.



Which of the following figures best represents the orbit of the particle in the phase space?

1.



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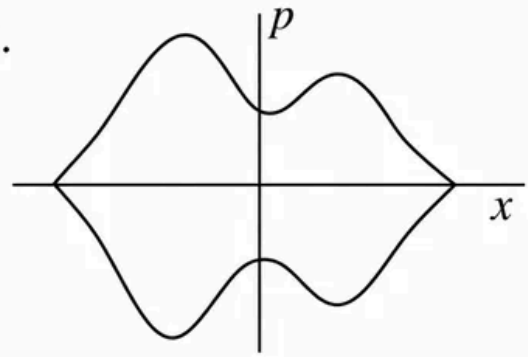

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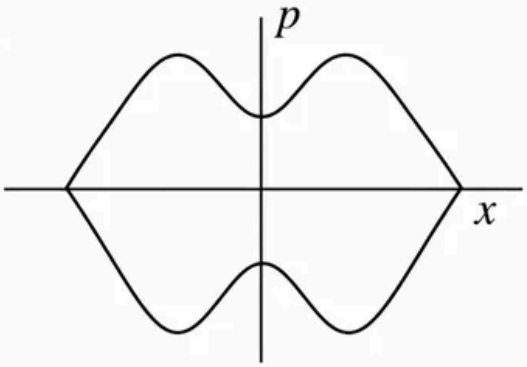

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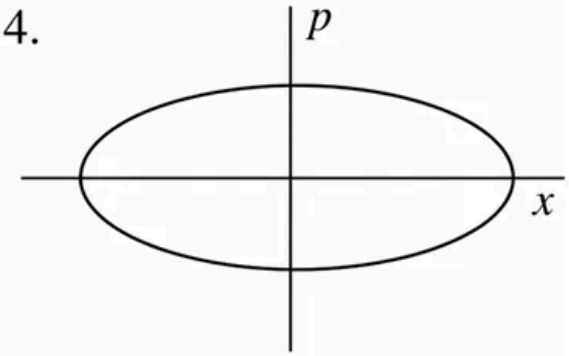


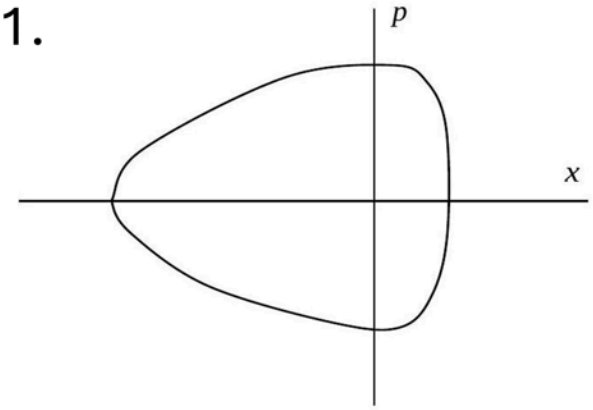
Q5. [June 2022] . 5.0 marks

Classical Mechanics > Phase space diagrams

CSIR NET	2022 June	5M

The Lagrangian of a particle in one dimension is $L = \frac{m}{2}\dot{x}^2 - ax^2 - V_0 e^{-10x}$ where a and V_0 are positive constants. The best qualitative representation of a trajectory in the phase space is

1.



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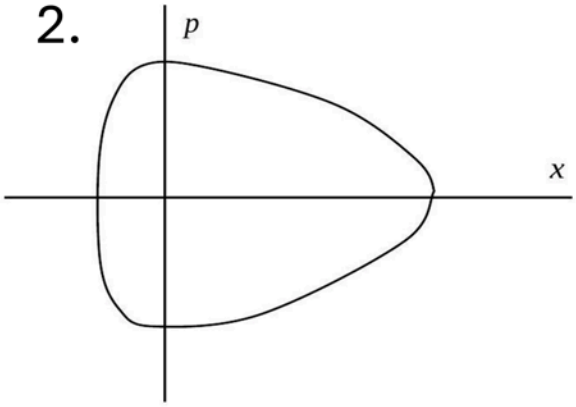

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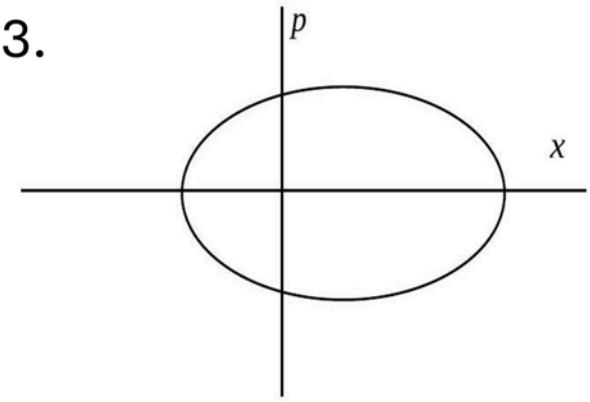

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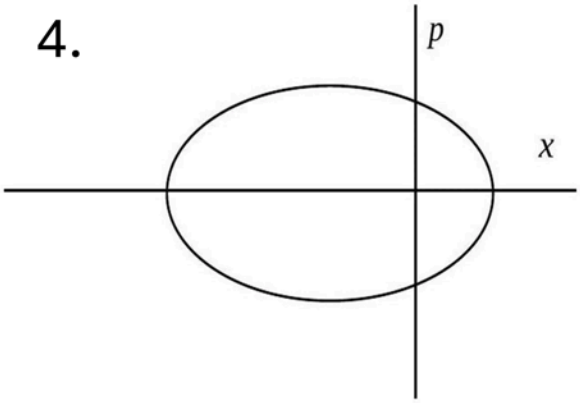


Q6. [June 2024] . 3.5 marks

Classical Mechanics > Phase space diagrams

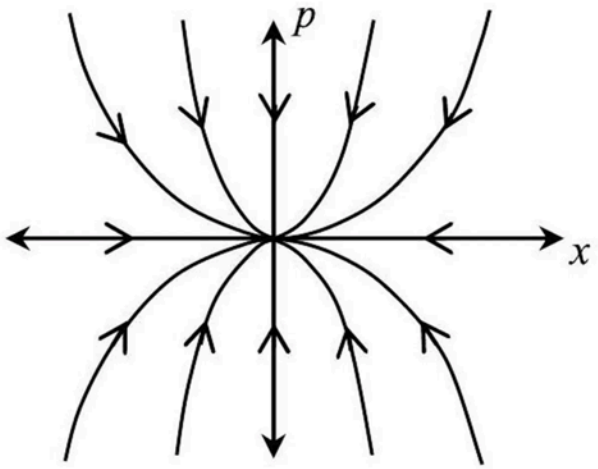
CSIR NET	2024 June	3.5M

The evolution of the dynamical variables $x(t)$ and $p(t)$ is given by

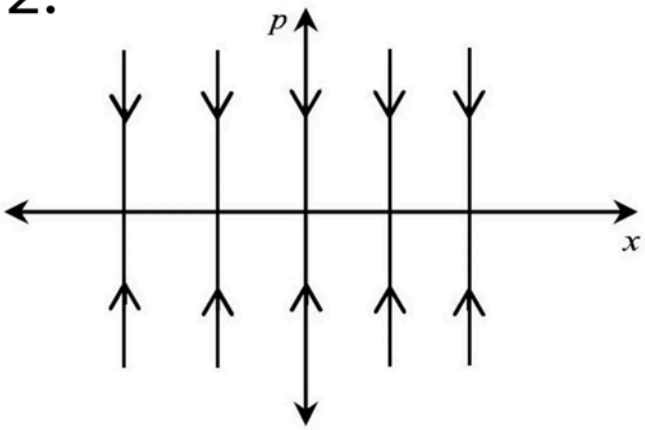
$$\dot{x} = ax, \dot{p} = -p$$

where a is a constant. The trajectory in (x, p) space for $-1 < a < 0$ is best described by

1.



2.



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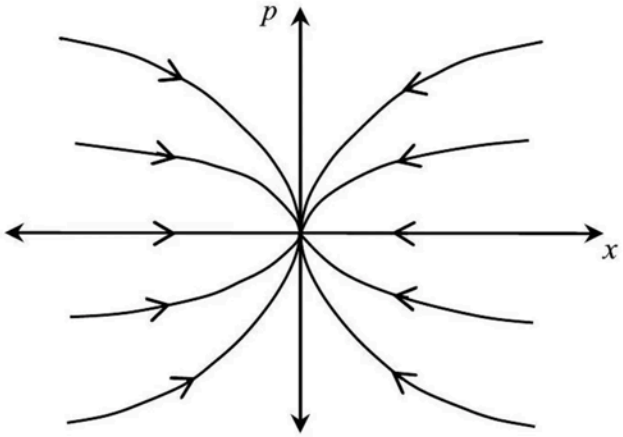

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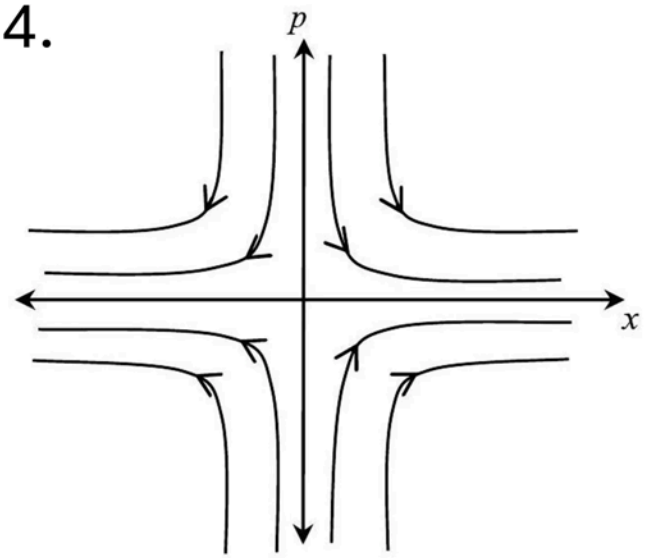
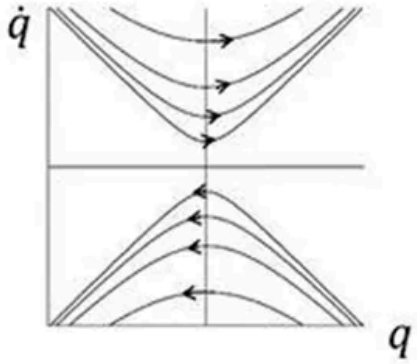


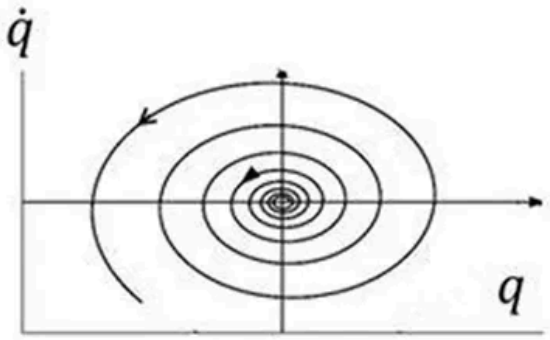
Q7. [Dec 2025] . 3.5 marks

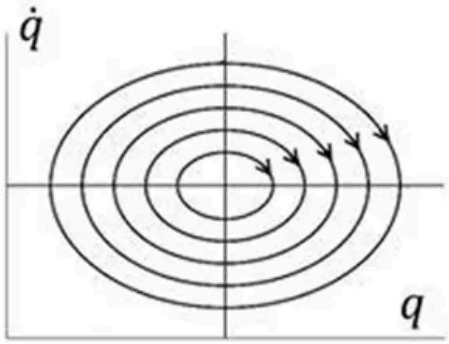
Classical Mechanics > Phase space diagrams

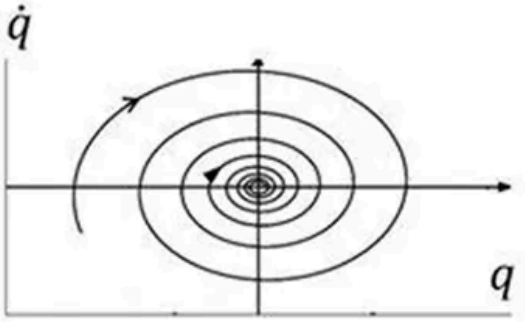
CSIR NET	2025 Dec	3.5M	CM

Which of the following figures best represents the motion of an oscillator described by the differential equation $\ddot{q} + \dot{q} + q = 0$ in $q - \dot{q}$ plane?

1. 

2. 

3. 

4. 

Answer Key

7 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Classical Mechanics	Phase space diagrams	**1**
Q2	Classical Mechanics	Phase space diagrams	**2**
Q3	Classical Mechanics	Phase space diagrams	**2**
Q4	Classical Mechanics	Phase space diagrams	**1**
Q5	Classical Mechanics	Phase space diagrams	**None**
Q6	Classical Mechanics	Phase space diagrams	**1**
Q7	Classical Mechanics	Phase space diagrams	**4**

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