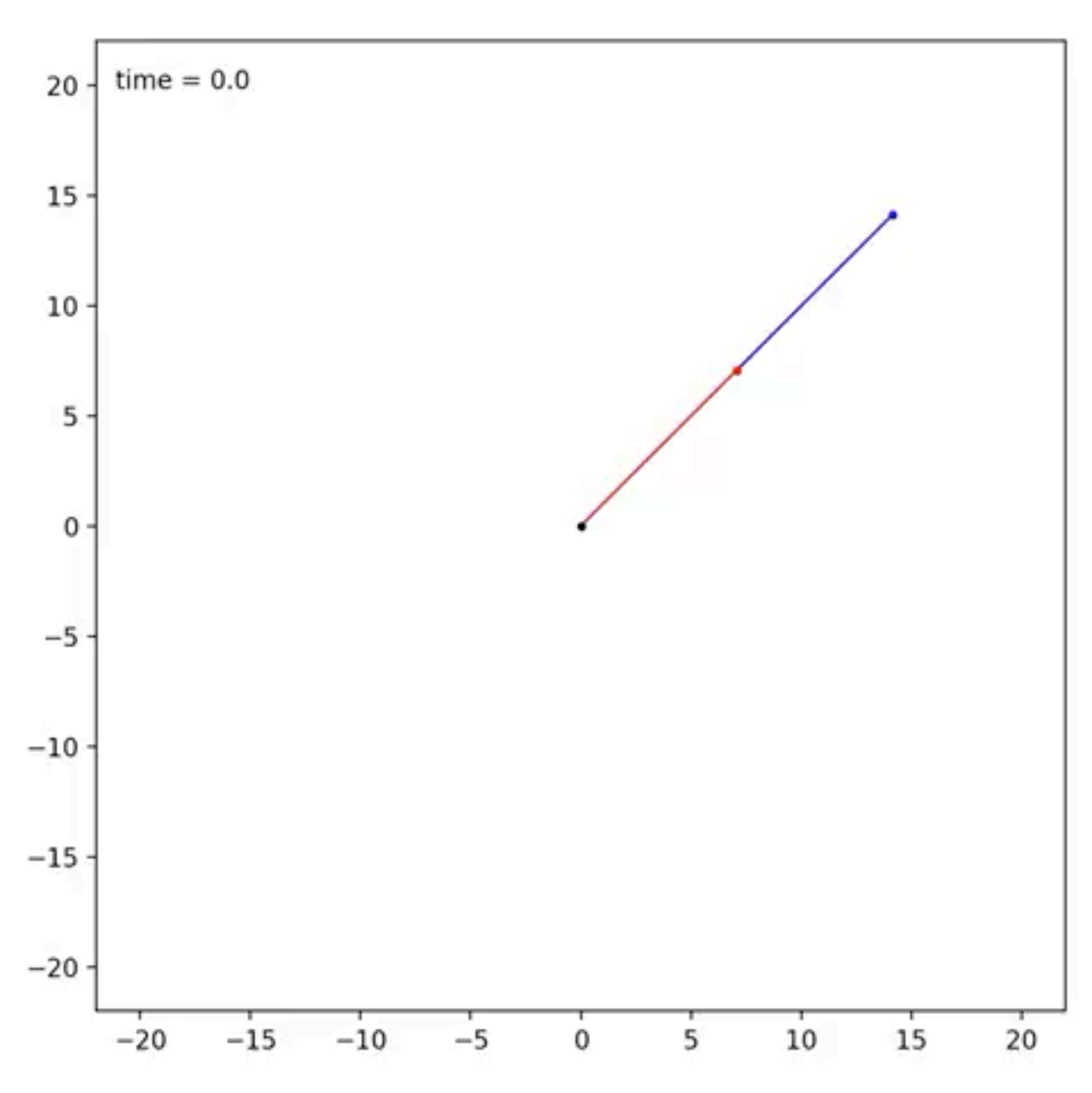
# Introduction

# About Double Pendulum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0
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−15
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−20
−15
−10
−5
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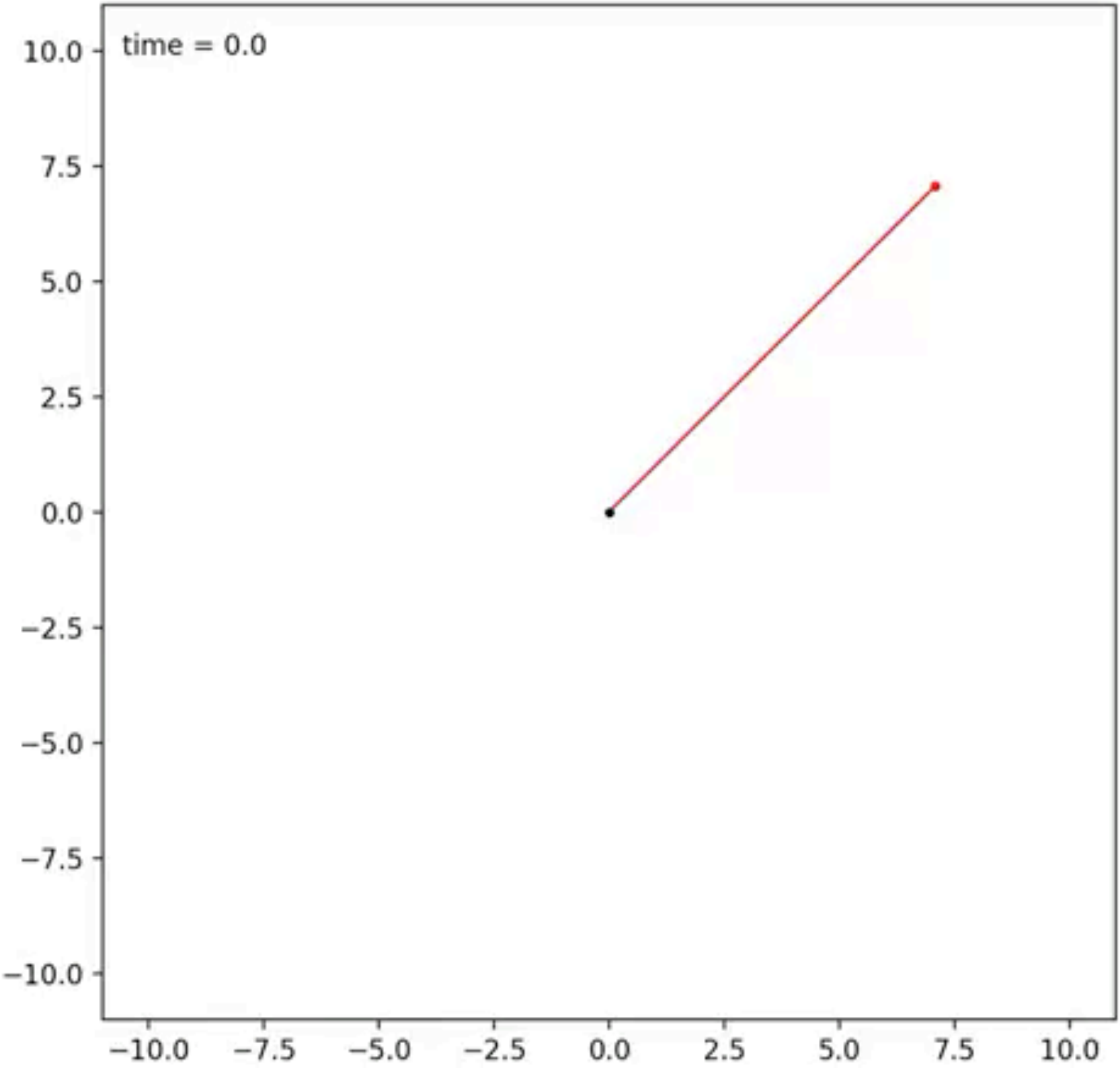
5
10
15
20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5.0
2.5
0.0
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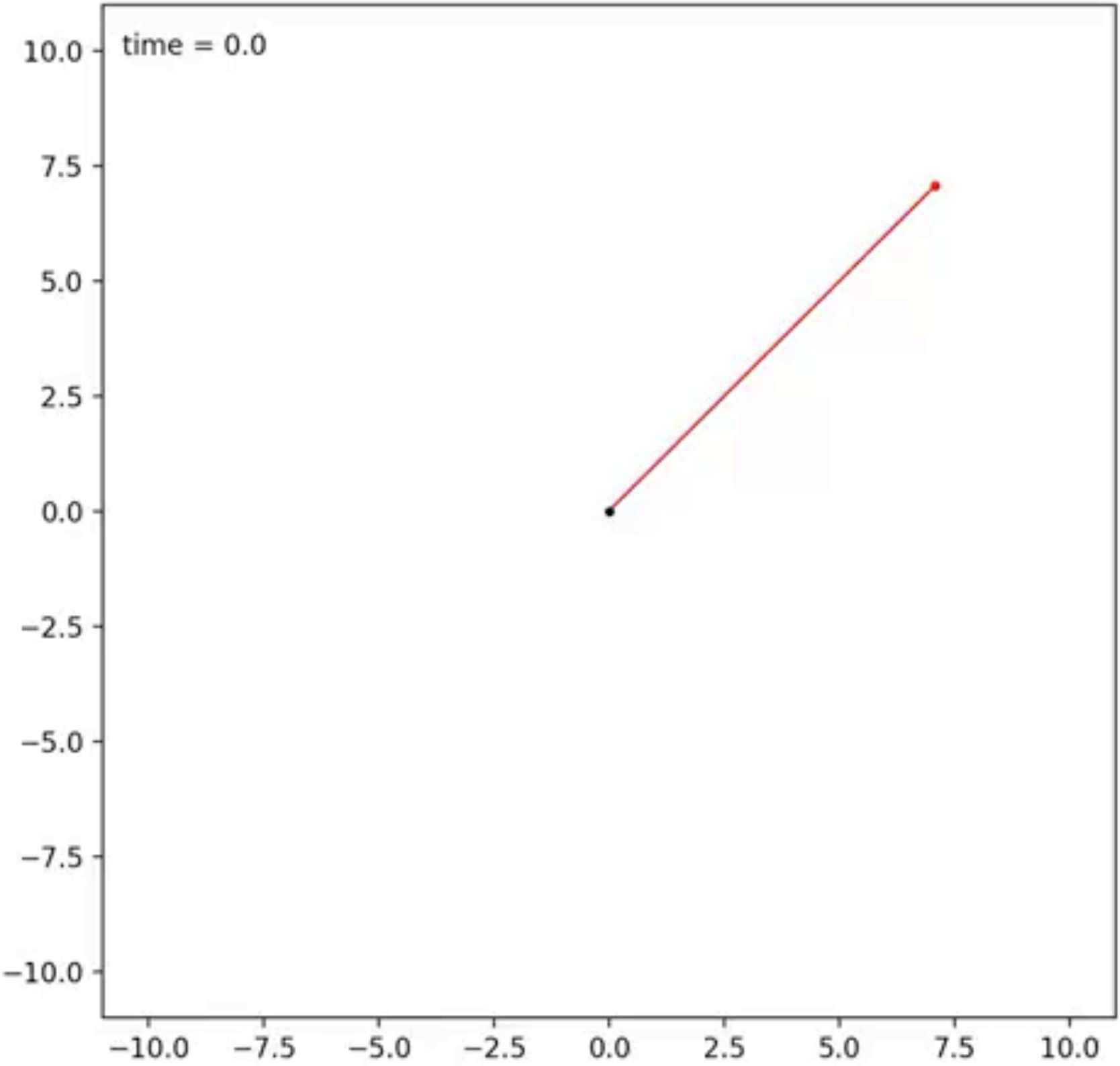
−7.5
−10.0
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0

# Single Pendulum

# Double Pendulum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7.5
5.0
2.5
0.0
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−5.0
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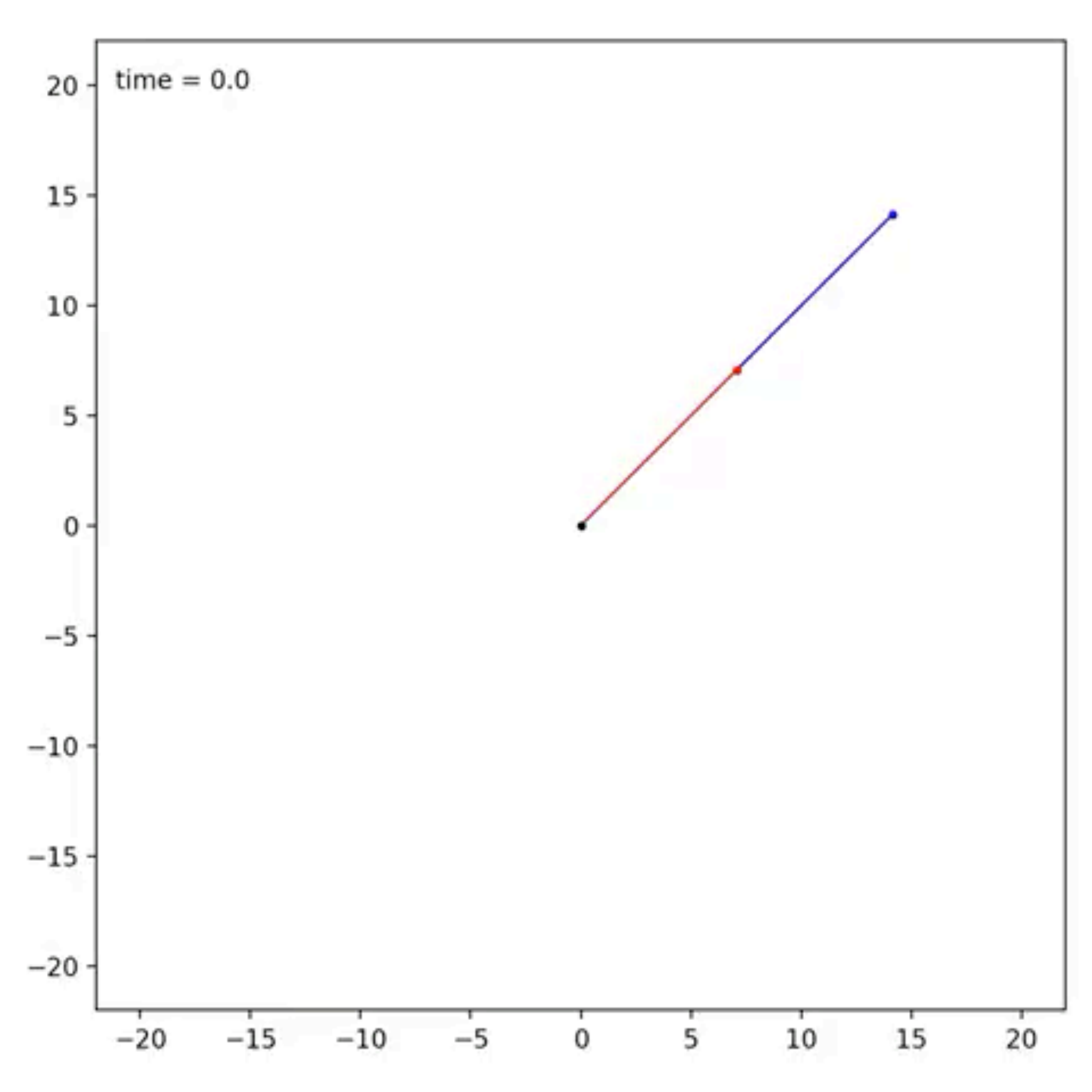
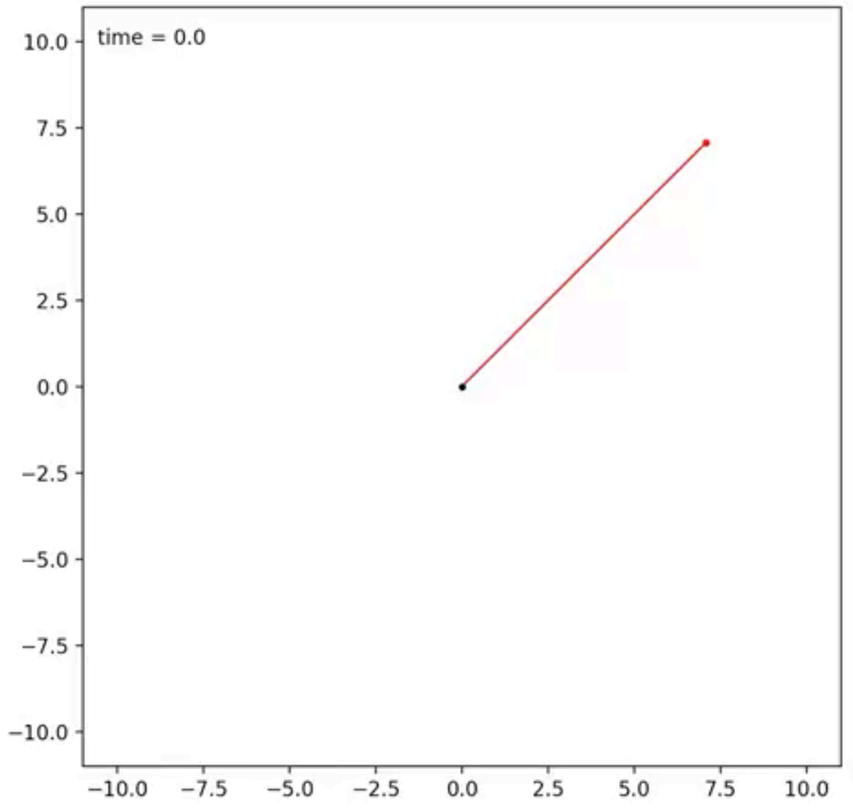
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0

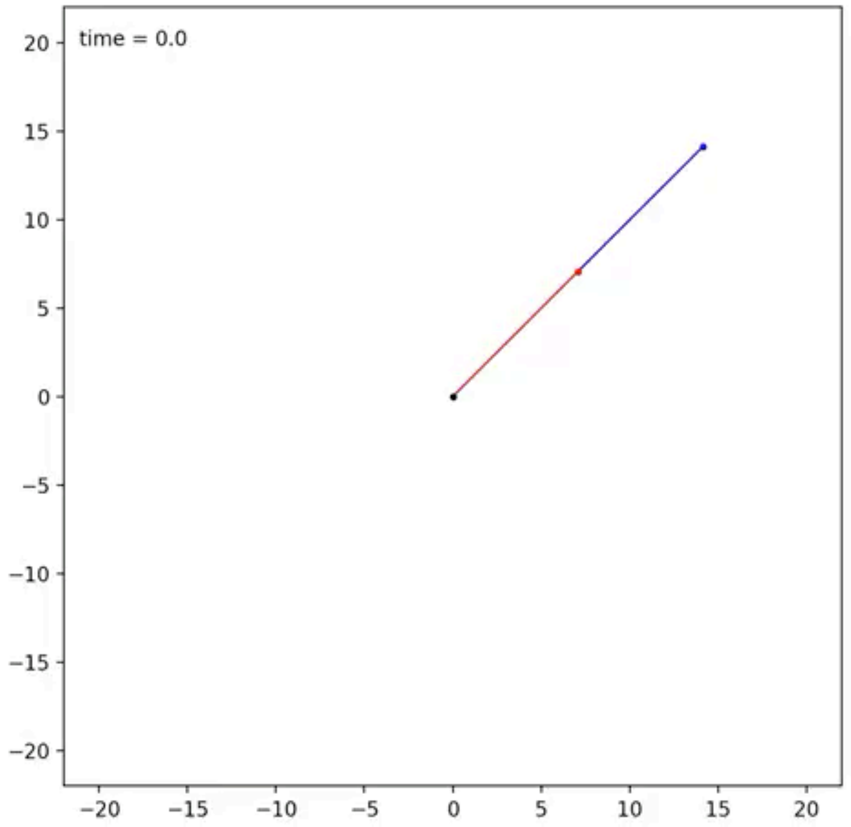

time = 0.0
20
15
10
5
0
−5
−10
−15
−20
−20
−15
−10
−5
0
5
10
15
20

# Introduction

## About Double Pendulum




Single Pendulum




Double Pendulum

# Introduction

## Double Pendulum's Equation of Motion

總動能 ( $T$ )

$$T = \frac{1}{2} m_1 l_1^2 \dot{\theta_1}^2 + \frac{1}{2} m_2 (l_1^2 \dot{\theta_1}^2 + 2 l_1 l_2 \cos(\theta_1 - \theta_2) \dot{\theta_1} \dot{\theta_2} + l_2^2 \dot{\theta_2}^2)$$

總位能 ( $V$ )

$$V = - m_1 g l_1 \cos(\theta_1) - m_2 g l_1 \cos(\theta_1) - m_2 g l_2 \cos(\theta_2)$$

拉格朗日值 ($\mathscr{L}$) 是總動能與總位能之差

$$\mathscr{L} = T - V$$

$$\mathscr{L} = \frac{1}{2} m_1 l_1^2 \dot{\theta_1}^2 + \frac{1}{2} m_2 l_1^2 \dot{\theta_1}^2 + m_2 l_1 l_2 \cos(\theta_1 - \theta_2) \dot{\theta_1} \dot{\theta_2} + \frac{1}{2} m_2 l_2^2 \dot{\theta_2}^2 + m_1 g l_1 \cos(\theta_1) + m_2 g l_1 \cos(\theta_1) + m_2 g l_2 \cos(\theta_2)$$

Illustration of a double pendulum