Q7.1

A piece of fruit falls straight down. As it falls,

A. the gravitational force does positive work on it and the gravitational potential energy increases.

B. the gravitational force does positive work on it and the gravitational potential energy decreases.

C. the gravitational force does negative work on it and the gravitational potential energy increases.

D. the gravitational force does negative work on it and the gravitational potential energy decreases.

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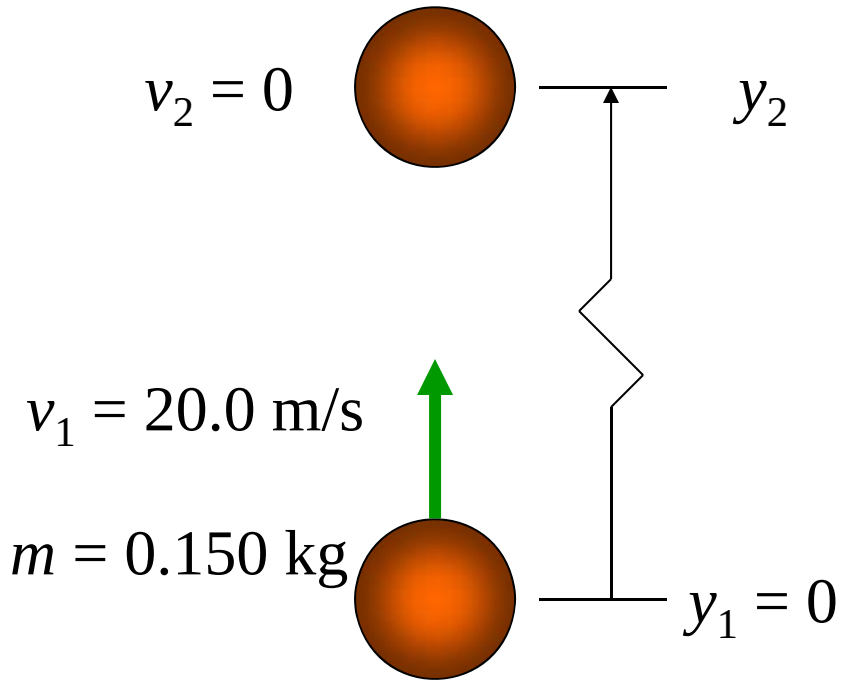
Q7.2

You toss a 0.150-kg baseball straight upward so that it leaves your hand moving at 20.0 m/s. The ball reaches a maximum height y_2.

What is the speed of the ball when it is at a height of $y_2/2$? Ignore air resistance.



A. 10.0 m/s

B. less than 10.0 m/s but greater than zero

C. greater than 10.0 m/s

D. not enough information given to decide

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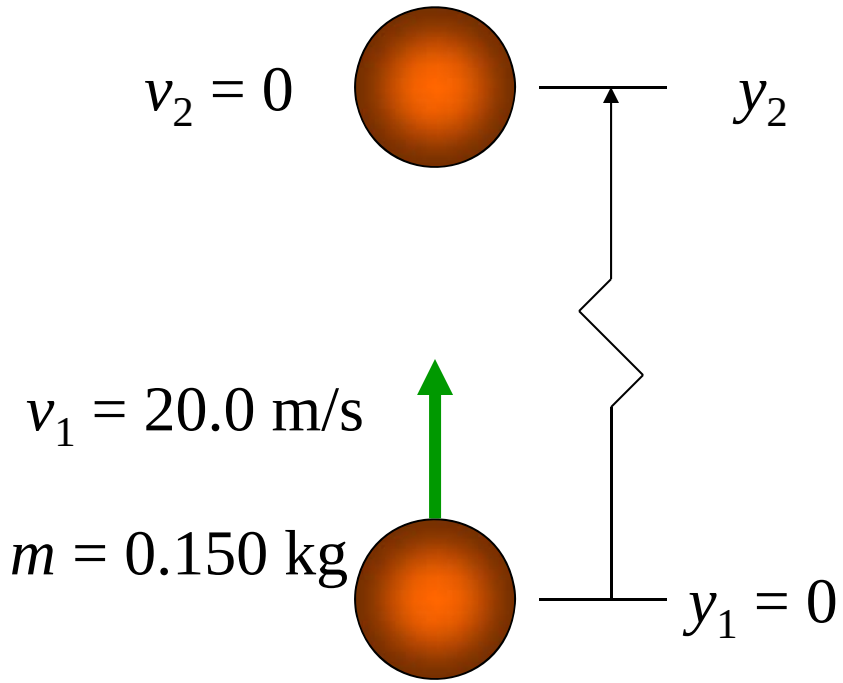


A. 10.0 m/s

B. less than 10.0 m/s but greater than zero

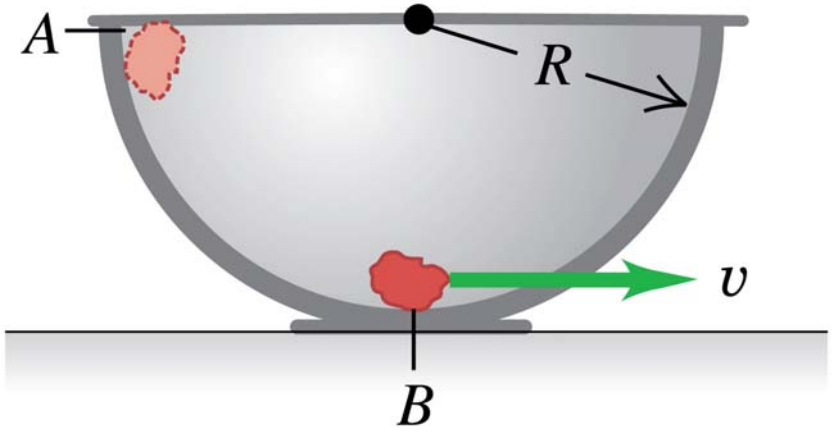
✓ C. greater than 10.0 m/s

D. not enough information given to decide

Q7.3

As a rock slides from *A* to *B* along the inside of this frictionless hemispherical bowl, mechanical energy is conserved. Why?

(Ignore air resistance.)



A. The bowl is hemispherical.

B. The normal force is balanced by centrifugal force.

C. The normal force is balanced by centripetal force.

D. The normal force acts perpendicular to the bowl's surface.

E. The rock's acceleration is perpendicular to the bowl's surface.

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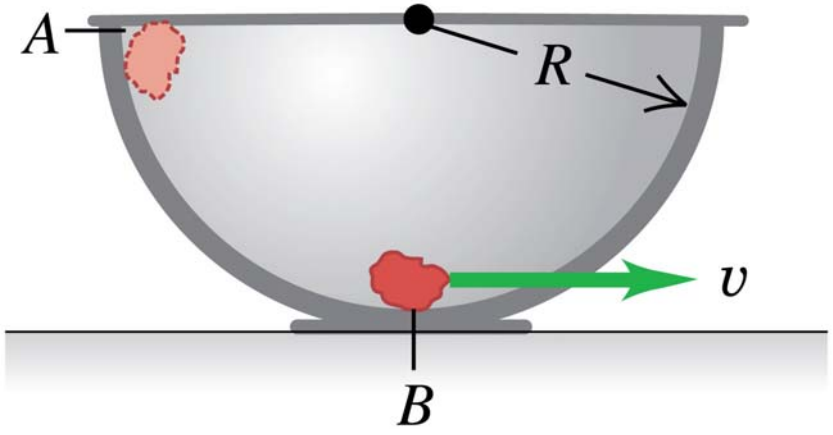

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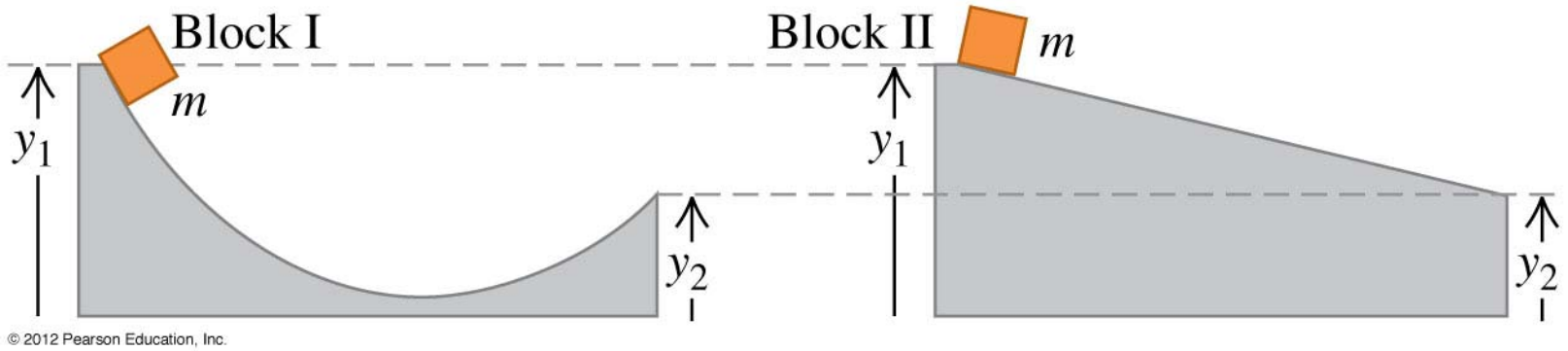
Q7.4

The two ramps shown are both frictionless. The heights y_1 and y_2 are the same for each ramp. A block of mass m is released from rest at the left-hand end of each ramp. Which block arrives at the right-hand end with the greater speed?



A. the block on the curved track

B. the block on the straight track

C. Both blocks arrive at the right-hand end with the same speed.

D. The answer depends on the shape of the curved track.

A7.4

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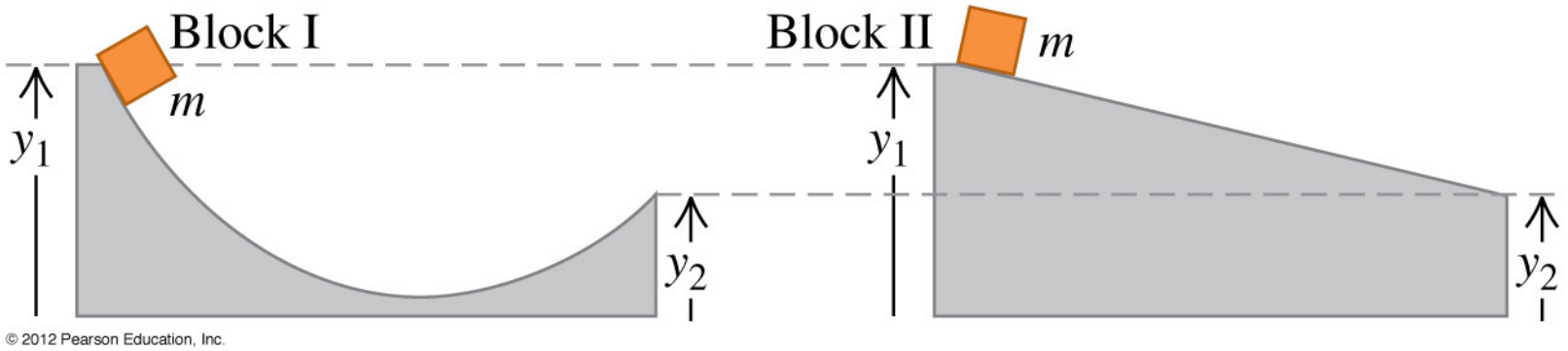

A. the block on the curved track

B. the block on the straight track

✓ C. Both blocks arrive at the right-hand end with the same speed.

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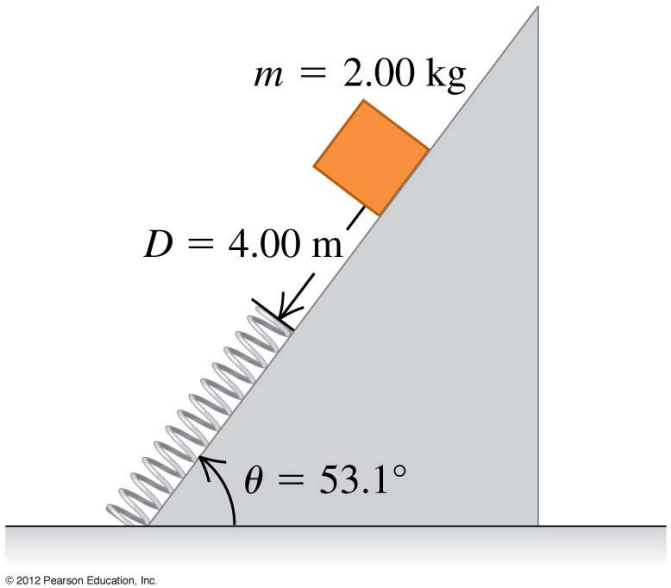
Q7.5

A block is released from rest on a frictionless incline as shown. When the moving block is in contact with the spring and compressing it, what is happening to the gravitational potential energy U_{grav} and the elastic potential energy U_{el}?



A. U_{grav} and U_{el} are both increasing.

B. U_{grav} and U_{el} are both decreasing.

C. U_{grav} is increasing; U_{el} is decreasing.

D. U_{grav} is decreasing; U_{el} is increasing.

E. The answer depends on how the block's speed is changing.

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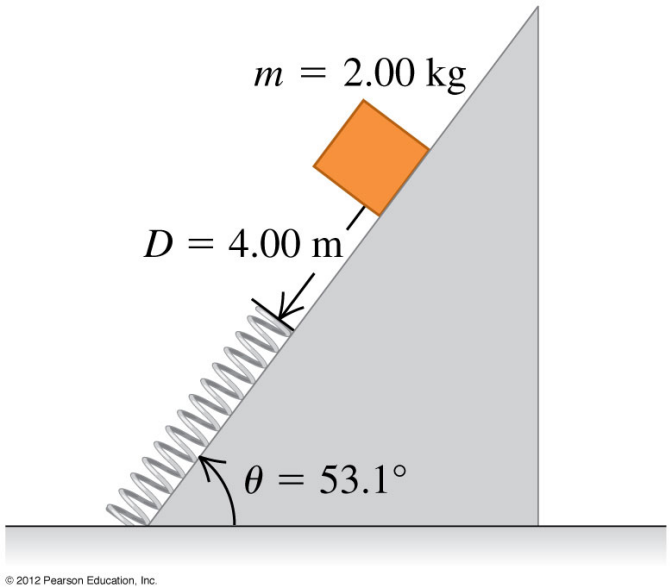


A. U_{grav} and U_{el} are both increasing.

B. U_{grav} and U_{el} are both decreasing.

C. U_{grav} is increasing; U_{el} is decreasing.

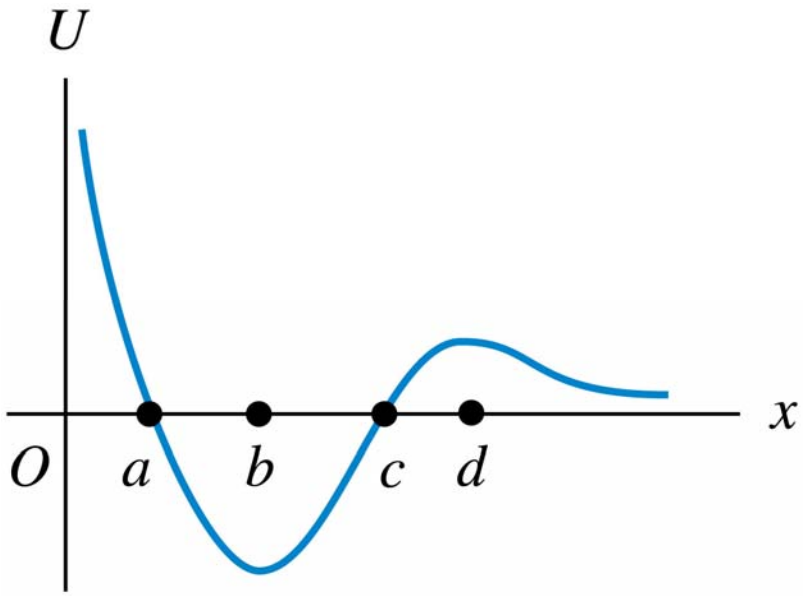
✓ D. U_{grav} is decreasing; U_{el} is increasing.

E. The answer depends on how the block's speed is changing.

Q7.6

The graph shows the potential energy U for a particle that moves along the x-axis.

The particle is initially at $x = d$ and moves in the negative x-direction. At which of the labeled x-coordinates does the particle have the greatest *speed*?



A. at $x = a$ B. at $x = b$ C. at $x = c$ D. at $x = d$

E. more than one of the above

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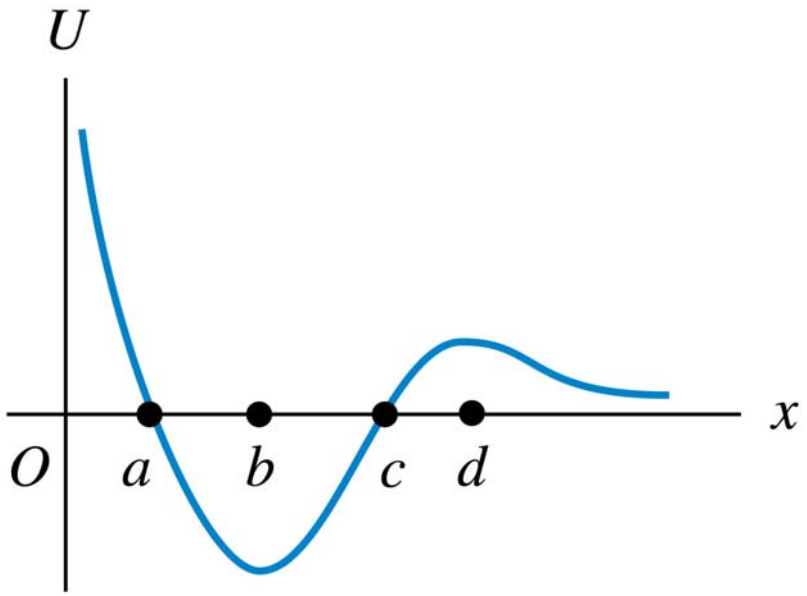


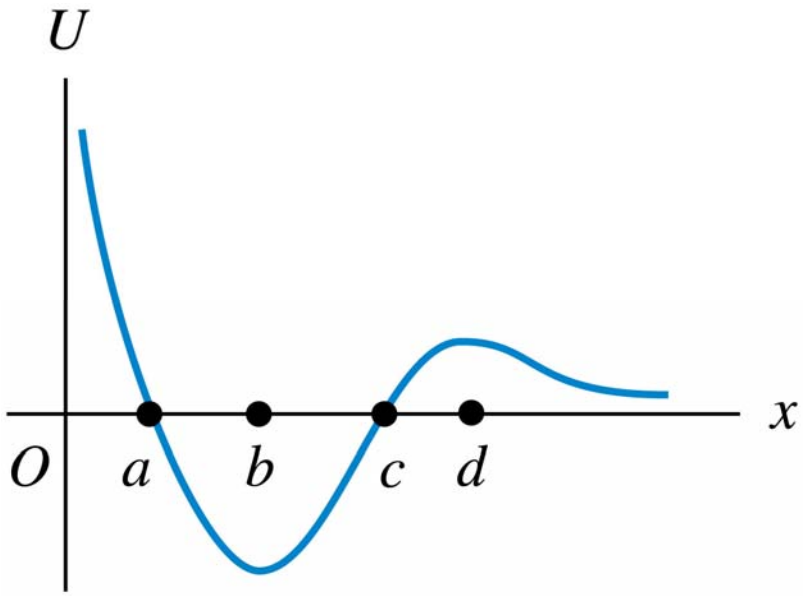
A. at $x = a$ ✓ B. at $x = b$ C. at $x = c$ D. at $x = d$

E. more than one of the above

Q7.7

The graph shows the potential energy U for a particle that moves along the x-axis.

The particle is initially at $x = d$ and moves in the negative x-direction. At which of the labeled x-coordinates is the particle *slowing down*?



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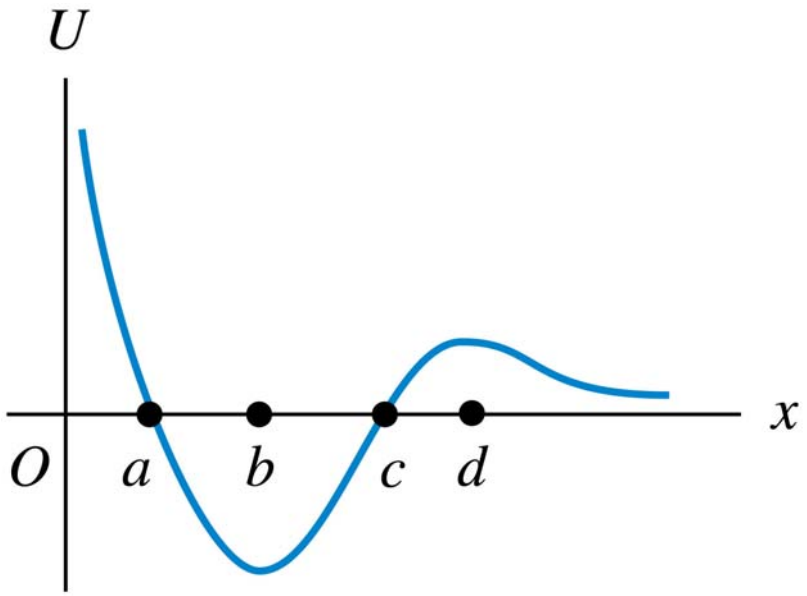

✓ A. at $x = a$ B. at $x = b$ C. at $x = c$ D. at $x = d$

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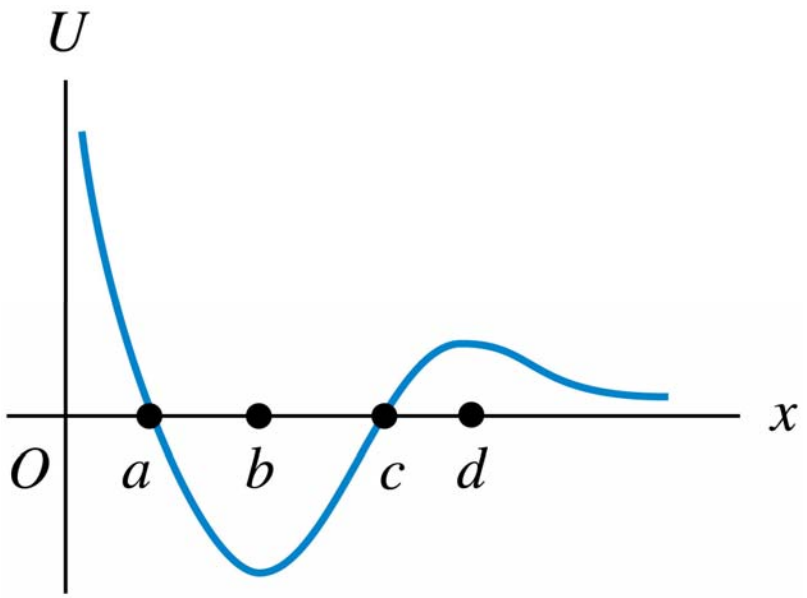
Q7.8

The graph shows the potential energy U for a particle that moves along the x-axis. At which of the labeled x-coordinates is there *zero* force on the particle?



A. at $x = a$ and $x = c$

B. at $x = b$ only

C. at $x = d$ only

D. at $x = b$ and d

E. misleading question—there is a force at all values of x

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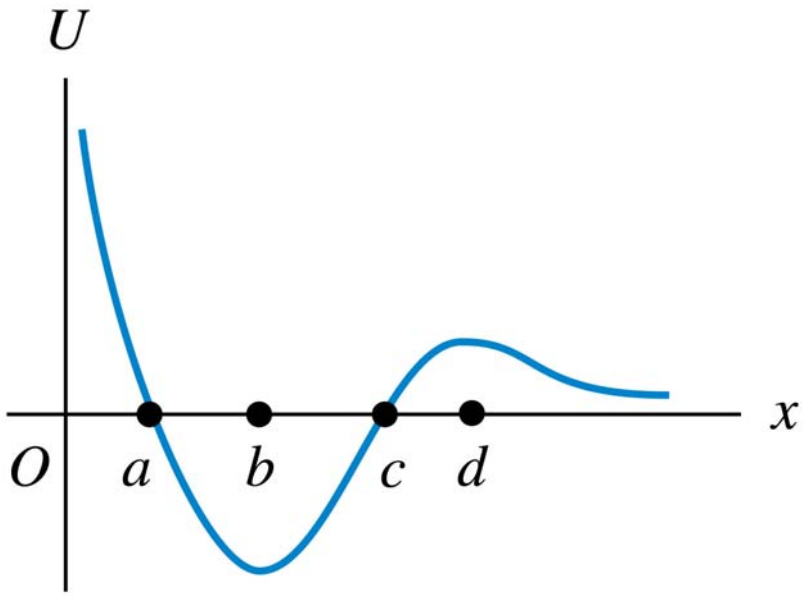

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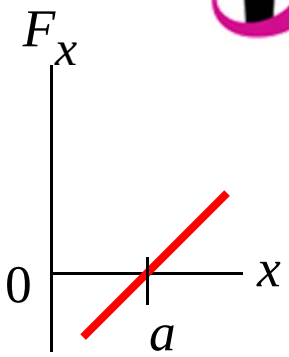
Q7.9



The graph shows a conservative force F_x as a function of x in the vicinity of $x = a$. As the graph shows, $F_x = 0$ at $x = a$. Which statement about the associated *potential energy* function U at $x = a$ is correct?

A. $U = 0$ at $x = a$

B. U is a maximum at $x = a$.

C. U is a minimum at $x = a$.

D. U is neither a minimum or a maximum at $x = a$, and its value at $x = a$ need not be zero.

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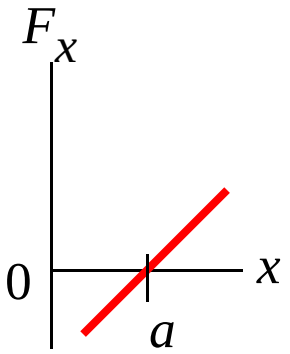

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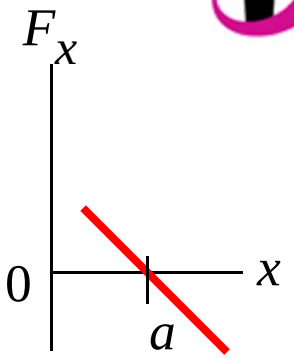
Q7.10



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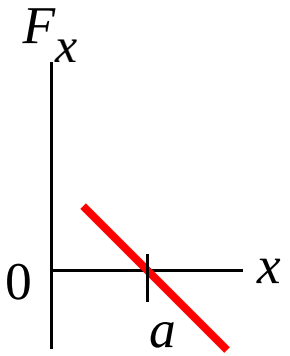

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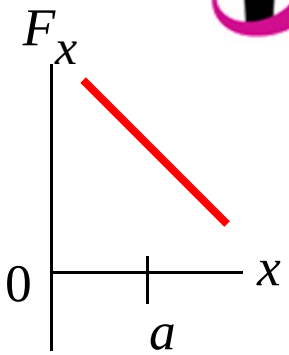
Q7.11



The graph shows a conservative force F_x as a function of x in the vicinity of $x = a$. As the graph shows, $F_x > 0$ and $dF_x/dx < 0$ at $x = a$. Which statement about the associated *potential energy* function U at $x = a$ is correct?

A. $dU/dx > 0$ at $x = a$

B. $dU/dx < 0$ at $x = a$

C. $dU/dx = 0$ at $x = a$

D. Any of the above could be correct.

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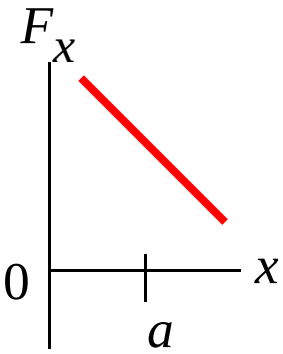

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✓ B. $dU/dx < 0$ at $x = a$

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D. Any of the above could be correct.

Q7.12

You push a block up an inclined ramp at a constant speed. There is friction between the block and the ramp.

The *rate* at which the internal energy of the block and ramp increases is

A. greater than the rate at which you do work on the block.

B. the same as the rate at which you do work on the block.

C. less than the rate at which you do work on the block.

D. not enough information given to decide

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