Acceleration

6/7 points earned (85%)

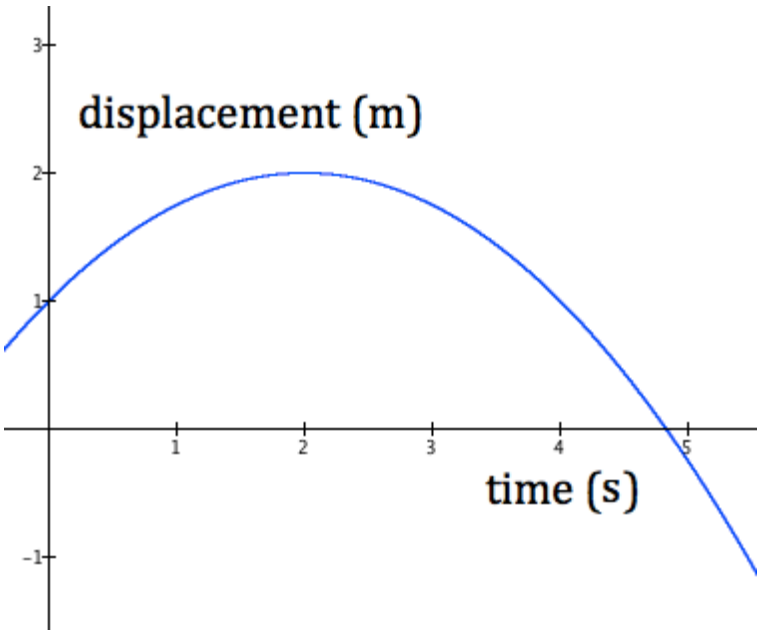
Retake

Next

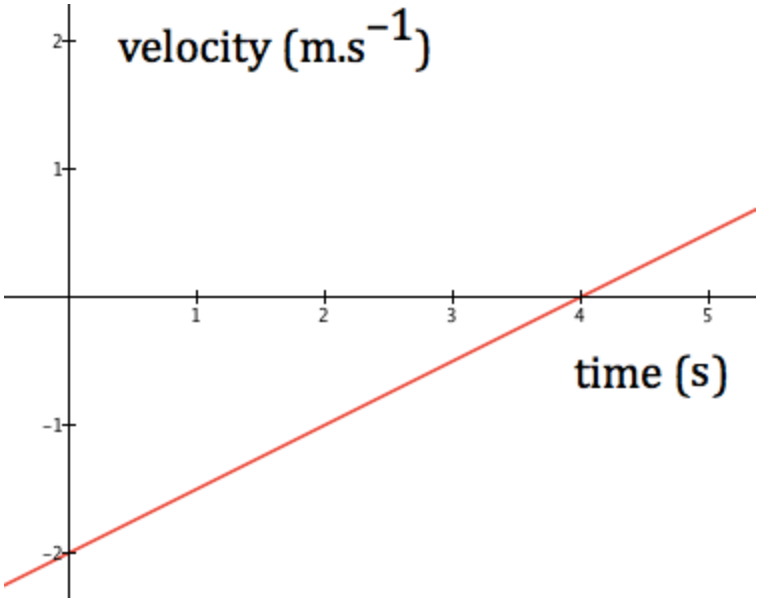
Excellent!

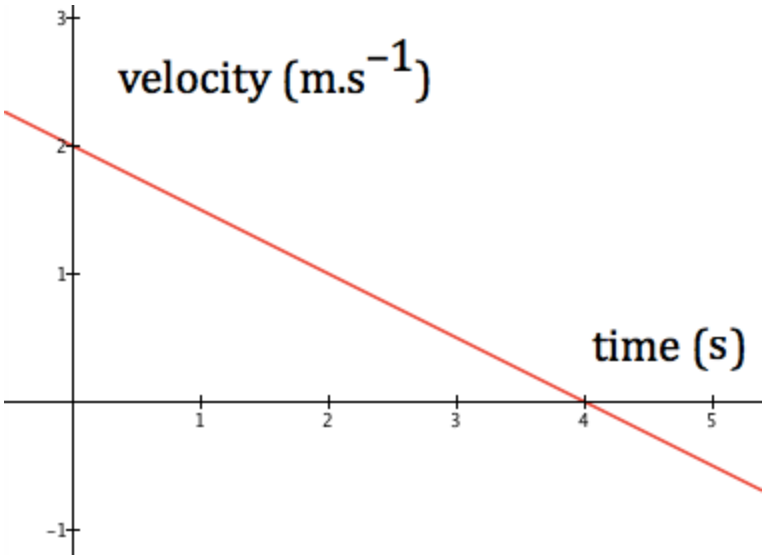
1 / 1 points

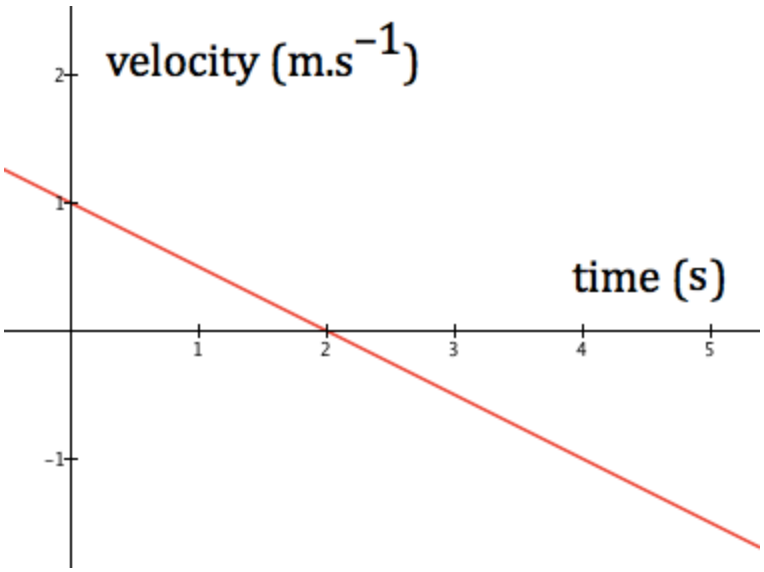
1.
[#221] **Match displacement to velocity**



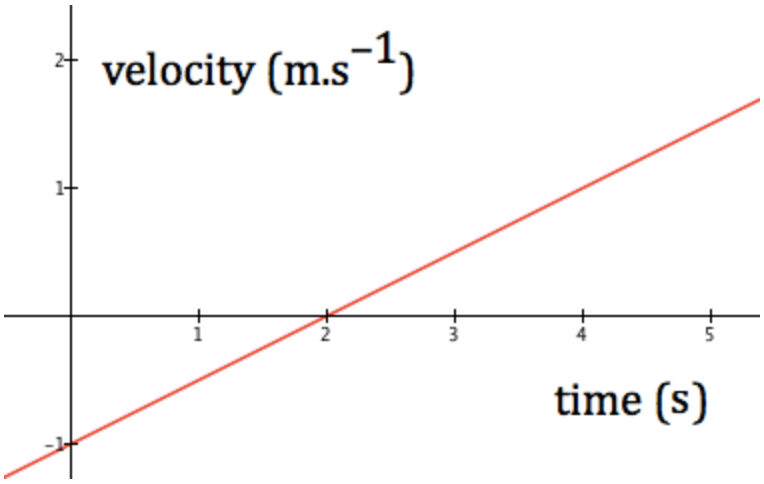
The above graph shows the displacement of an object versus time. Which of the following graphs corresponds to the object's **velocity**?

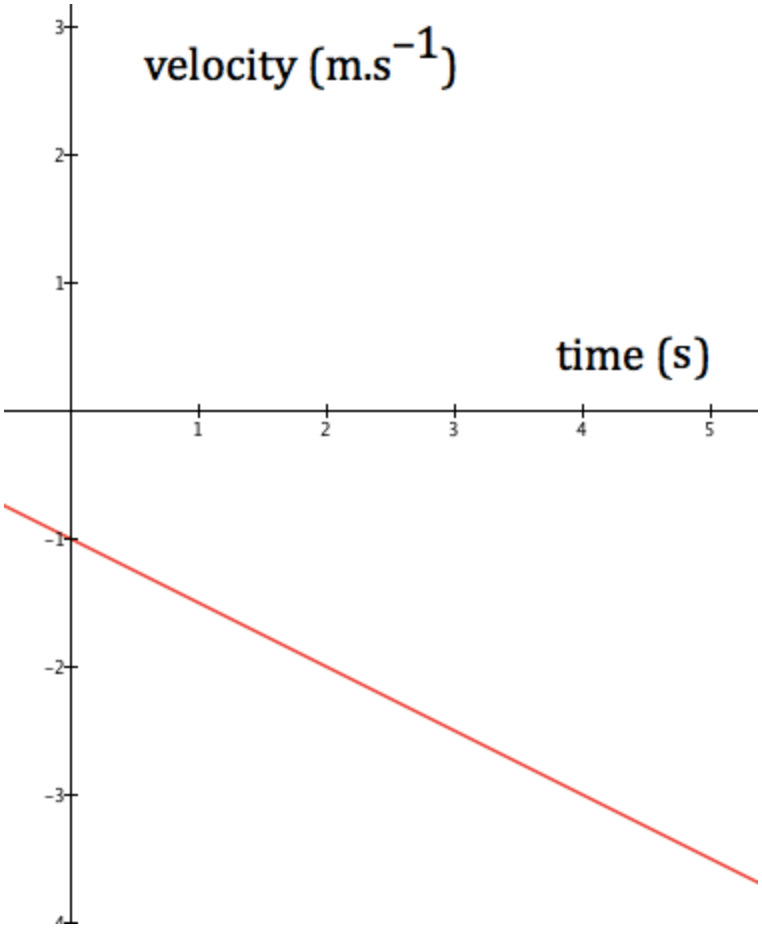






Correct

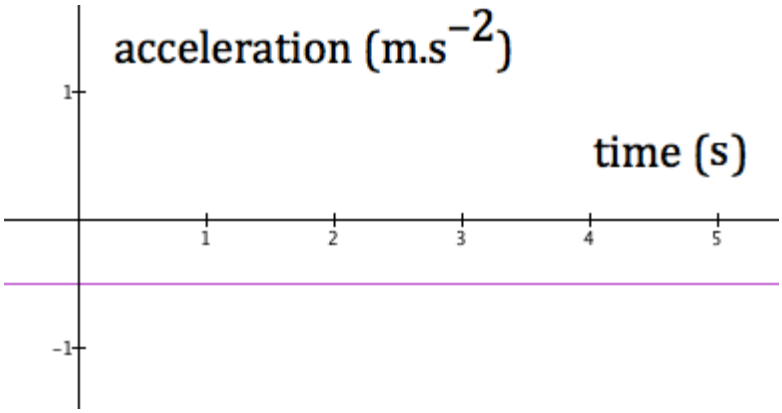




0 / 1 points

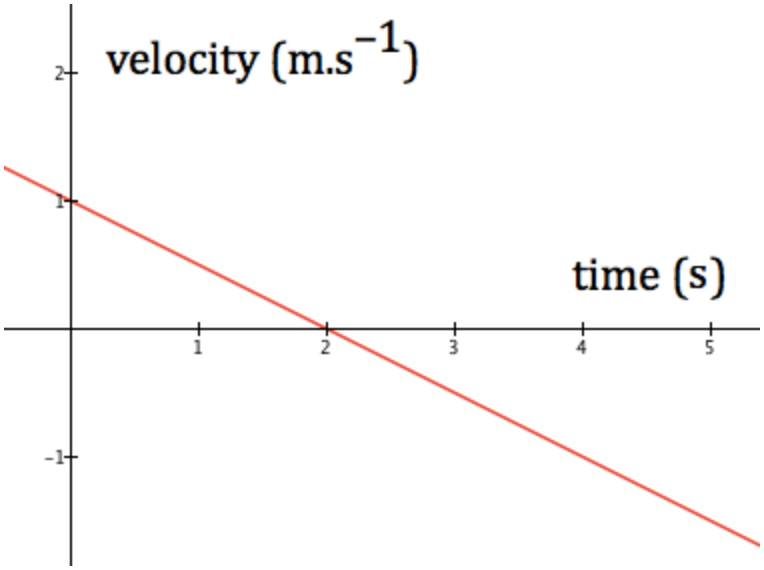
2.

[#222] **Match acceleration to velocity**



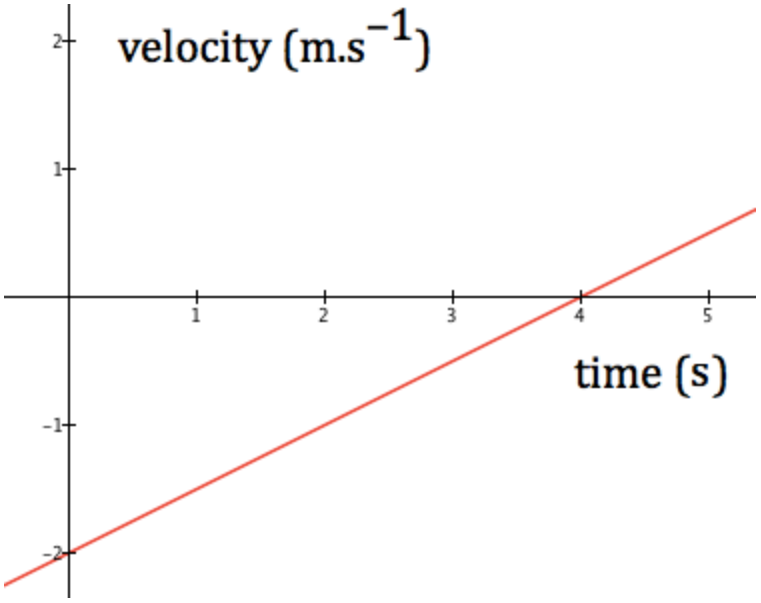
The above graph shows the acceleration of an object versus time. Which of the following graphs represent the object's **velocity**? (Choose one or more)

☐



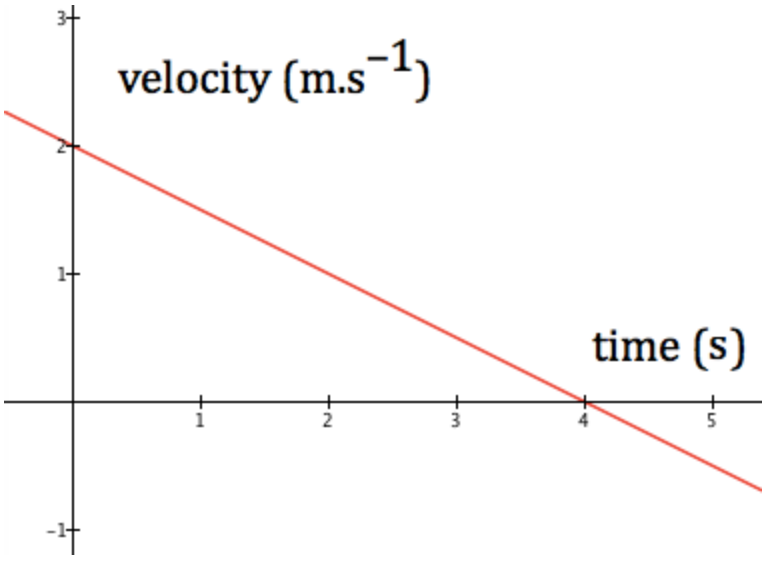
This should be selected

☐

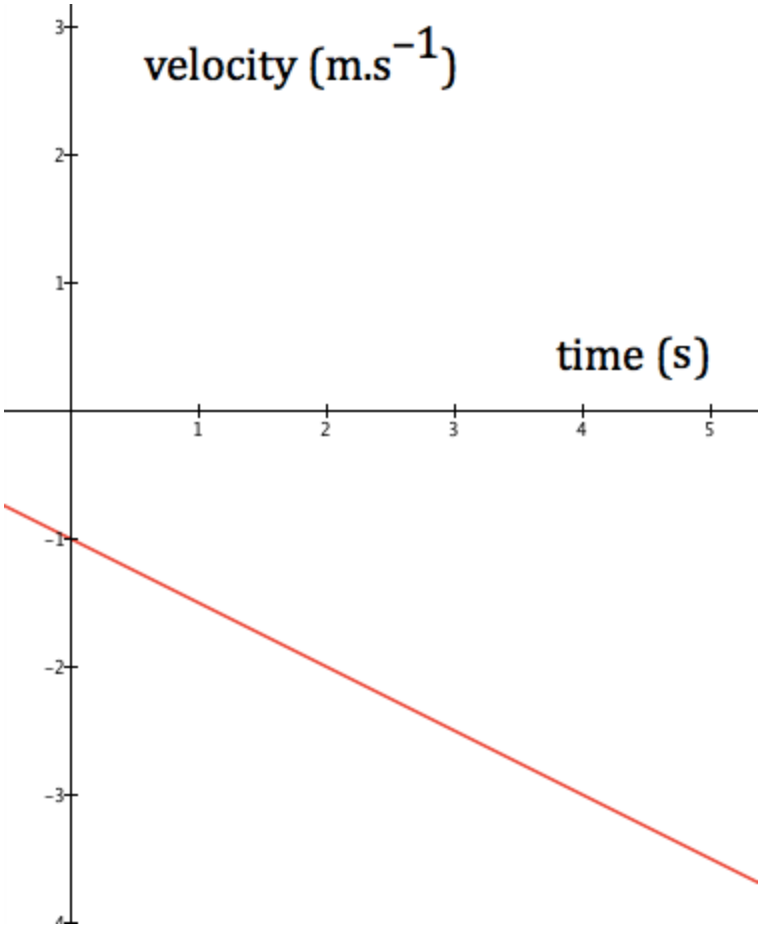


This should not be selected

The acceleration graph indicates a decelerating object (negative acceleration). This object is accelerating.



Correct

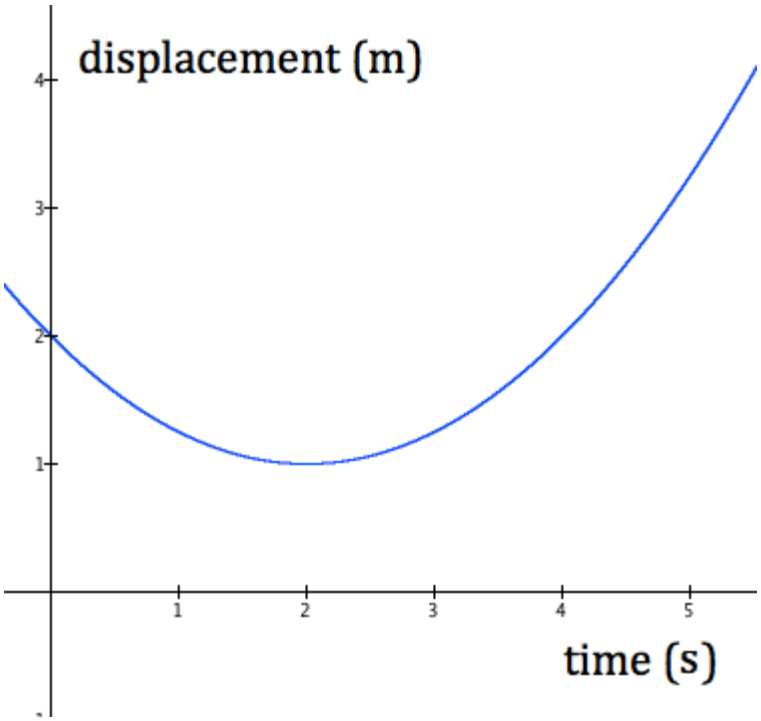


Correct

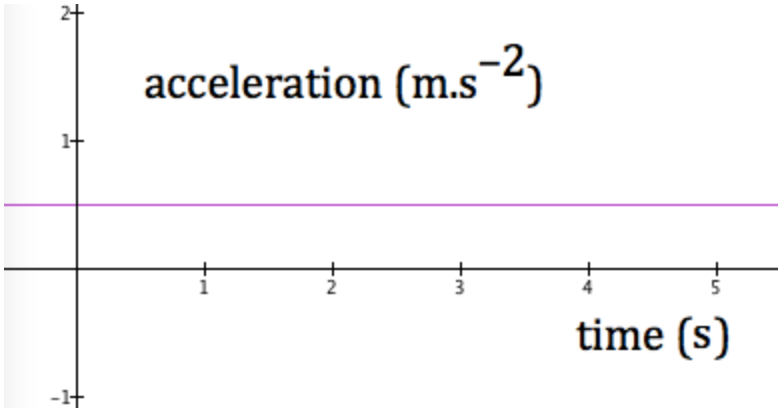
1 / 1 points

3.

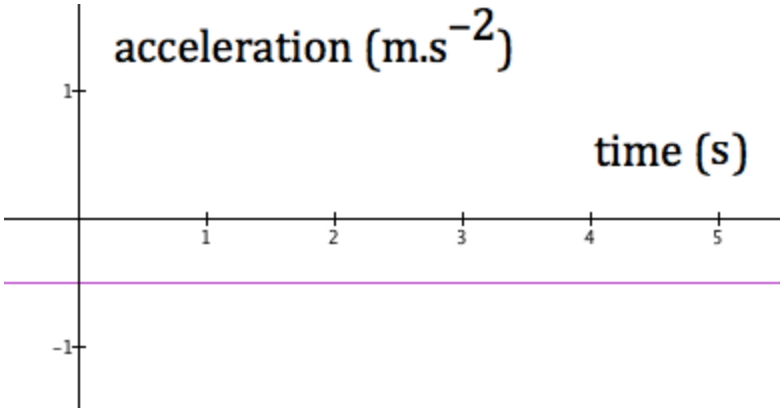
[#223] **Match displacement to acceleration**



The above graph shows the displacement of an object versus time. Which of the following graphs corresponds to the object's **acceleration**?

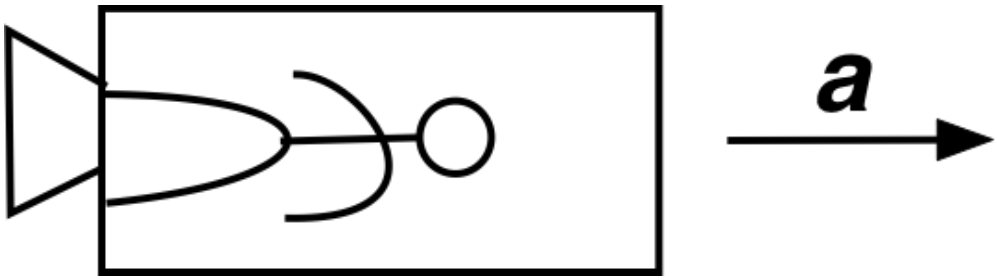


Correct



1 / 1 points

4.
[#224] **Artificial gravity**



Science fiction writers imagine a ship in deep space, accelerating at a constant 9.8 m.s^{-2}, which gives the travellers a sensation similar to the weight they feel on the Earth, where falling objects accelerate at g = 9.8 m.s^{-2}. Starting from rest (and ignoring effects due to special relativity), how long does it take such a ship to accelerate to 0.1 times the speed of light c (recalling that c = 3.0*10^{8} m.s^{-1}), and how far does it travel during that time? (Note: 0.1 has only 1 sig fig!)

Answer: The ship travels for _____ and travels a distance of _____ .

- $4 \text{ days}, 5 \times 10^{8} \text{ km}$
- $40 \text{ days}, 5 \times 10^{10} \text{ km}$

Correct

- $4 \text{ days}, 5 \times 10^{14} \text{ km}$
- $40 \text{ days}, 5 \times 10^{4} \text{ km}$

1 / 1 points

5.
[#225] **Drop that ball**

You drop a ball, which accelerates downwards with constant acceleration $g = 9.8\ \mathrm{m.s^{-2}}$. It falls a distance of 0.50 m to the ground.

The ball hits the ground in _____ seconds. When it hits the ground, it is travelling at a velocity of ____ m/s. (The up direction is positive.)

Write your answers below, separated by a comma (ex: a, b). Remember signs and *use appropriate significant figures*.

0.32, -3.1

Correct Response

Let's define the positive direction as up, with the ground at $y = 0$ and the initial height of the ball at $y_0 = 0.50\ \mathrm{m}$ above the floor. The ball starts from rest, so $v_0 = 0$.

We write
$y = y_0 + v_0 t + (1/2)at^2 = 0.50\ \mathrm{m} - (1/2)(9.8\ \mathrm{m.s^{-2}})t^2$. Note that acceleration is negative, since it acts downward.

When the ball hits the ground,
$y = 0 = 0.50\ \mathrm{m} - (1/2)(9.8\ \mathrm{m.s^{-2}})t^2$.

Solving for t, we find $t = \sqrt{\frac{2*0.50\ \mathrm{m}}{9.8\ \mathrm{m{\cdot}s^{-2}}}} = 0.32\ \mathrm{s}$.

When the ball hits the ground, it is travelling
$v = at = -gt = -3.1\ \mathrm{m/s}$.

We accept as answers: 0.32, -3.1

Show other acceptable responses

1 / 1 points

6.
[#226] **Drop that ball – again**

You drop a ball from a height h, and it takes a time t to reach the ground.Then you drop the same ball from a height $2h$, and it takes time T to reach the ground. Which of the following is/are true?

- [x] T is greater than t

Correct
This statement is true. It will take more time than t for the ball to drop from height $2h$.

- [x] T is less than $2t$

Correct
This statement is true. It will take more time than t for the ball to drop from height $2h$, but it will take less than twice t, since the ball is accelerating.

- [x] $T = \sqrt{2} \cdot t$

Correct
This statement is true. We can write $h - (1/2)gt^2 = 0$ for the ball dropped from height h. We can write $2h - (1/2)gT^2 = 0$ for the ball dropped from height $2h$. Putting these 2 equations together, we find that $T = \sqrt{2} \cdot t$.

- [x] $T = 2t$

Un-selected is correct

- [x] $T = 2\sqrt{2} \cdot t$

Un-selected is correct

- [x] T is greater than $2t$

Un-selected is correct

1 / 1 points