

**Acceleration**

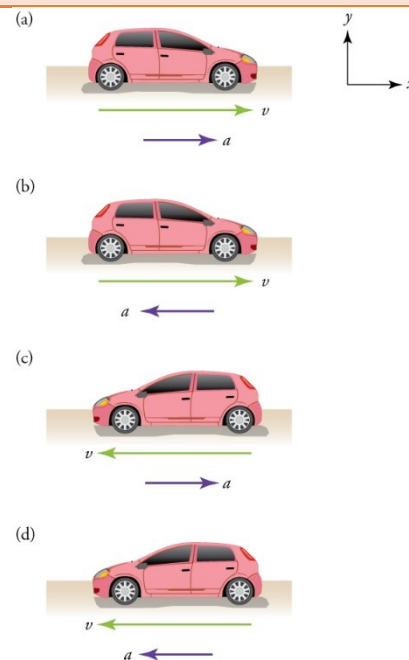
- Rate of change of \_\_\_\_\_

$$\bar{a} = \frac{\Delta v}{\Delta t}$$

$$\bar{a} = \frac{v_f - v_0}{t_f - t_0}$$

$$v = at + v_0$$

- \_\_\_\_\_
- Unit: \_\_\_\_\_
- If the acceleration is \_\_\_\_\_ direction as motion, then the object is \_\_\_\_\_ speed.
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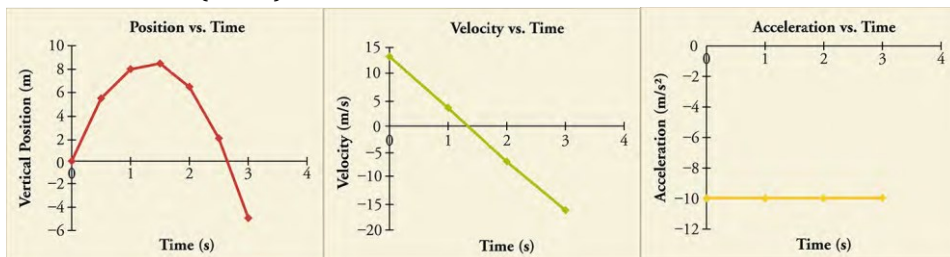


A horse starts running. If it goes from 0 to 55 km/h in 3.5 s, what is the horse's acceleration?

A car slows from 15 m/s to 10 m/s by an acceleration of 4 m/s<sup>2</sup>. How much time did it take to slow down?

**Constant acceleration**

- The graph of position-time is \_\_\_\_\_
  - ( $d = \frac{1}{2}at^2 + v_0t + d_0$  is \_\_\_\_\_)
- The graph of velocity-time is \_\_\_\_\_
  - ( $v = at + v_0$  is \_\_\_\_\_)
- The graph of acceleration-time is \_\_\_\_\_
  - ( $a = a$ )



**Practice Work**

1. Is it possible to have a nonzero acceleration and a (a) constant velocity? (b) constant speed? (RW)
2. A horse is running towards the east and has a westward acceleration. Is the horse speeding up or slowing down? (RW)
3. If a car is traveling forwards, but slowing down, which direction is its acceleration? (RW)
4. An object has a constant positive acceleration. Describe the (a) position vs. time graph, (b) velocity vs. time graph, and (c) acceleration vs. time graph. Include the direction of the curve or line. (RW)
5. A cheetah can accelerate from rest to a speed of 30.0 m/s in 7.00 s. What is its acceleration? (OpenStax 2.16) **4.29 m/s<sup>2</sup>**
6. A motorcycle has a constant acceleration of 2.5 m/s<sup>2</sup>. Both the velocity and acceleration of the motorcycle point in the same direction. How much time is required for the motorcycle to change its speed from (a) 21 to 31 m/s, and (b) 51 to 61 m/s? (Cutnell 2.13) **4.0 s, 4.0 s**
7. A runner accelerates to a velocity of 5.36 m/s due west in 3.00 s. His average acceleration is 0.640 m/s<sup>2</sup>, also directed due west. What was his velocity when he began accelerating? (Cutnell 2.15) **3.44 m/s W**
8. A motorcycle moving at a constant velocity suddenly accelerates at a rate of 4.0 m/s<sup>2</sup> to a speed of 35 m/s in 5.0 s. What was the initial speed of the motorcycle? (HSP 3.8) **15 m/s**
9. A deer is walking through the woods at 1.0 m/s when it sees a coyote. The deer accelerates to 5.0 m/s in 2.0 seconds. What was the deer's acceleration? (RW) **2.0 m/s<sup>2</sup>**
10. The deer out runs the coyote and slows down at a rate of 0.50 m/s<sup>2</sup> from the 5.0 m/s that it was running. If it decelerates for 3 seconds, what is its final speed? (RW) **3.5 m/s**
11. Next, the deer decides it is hungry for some corn, so it continues jogging towards a cornfield at 3.5 m/s. If it continues to run at 3.5 m/s for 3.0 minutes, what is the deer's acceleration? (RW) **0 m/s<sup>2</sup>**
12. Then, the deer gets thirsty after eating all that corn, so it accelerates from rest to 3.0 m/s at a rate of 0.70 m/s<sup>2</sup> and trots towards a stream. For how much time did the deer accelerate? (RW) **4.3 s**