Ty Marking

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Discussion Questions Page 61: 2.2-2.5, 2.9, 2.10, 2.12, 2.20

2.2 – Graph d is the most plausible graph because the fly is traveling a larger distance each time period which equates to a larger velocity which is what graph d shows by having larger values of vx as time increases.

2.3 – An object with constant acceleration can reverse direction once. If an object is traveling north at 10 m/s but has an acceleration of 2m/s in the southerly direction, its velocity will decrease by 2 m/s until it hits zero at which point it will travel south at an increasing velocity.

2.4 – An average velocity is equal to an instantaneous velocity when there is no acceleration.

2.5 – a) Yes, if the acceleration is in the opposite direction of the velocity the acceleration could increase which would cause the object to be slowed down. b) Yes, even if an object’s acceleration is decreasing, it is still under acceleration and assuming that acceleration is in the same direction as the objects velocity the object’s velocity will still be increasing even when the acceleration is very small,

|  |  |
| --- | --- |
| x | t |
| 0 | 0 |
| 1 | 1 |
| 3 | 2 |
| 1 | 3 |
| 0 | 0 |

|  |  |
| --- | --- |
| x | t |
| 0 | 0 |
| 2 | 1 |
| 4 | 2 |
| 6 | 3 |

2.9 – An object which has zero displacement (as shown to the left), cannot have a nonzero average velocity because the distance would be zero resulting in a zero average velocity. The same object however can have a nonzero velocity at some times because it can still move and have velocity and have acceleration as long as it ends up at its starting location at the end of the interval.

2.10 – An object can have zero acceleration and a nonzero velocity if it has a nonzero velocity and then no acceleration is applied leaving the velocity constant at a nonzero magnitude.

2.12 – A car can have a velocity towards the west and an acceleration towards the east if the car is already moving in an easterly direction when the brakes are applied and its velocity is decreased by a westerly acceleration. The velocity is still in an eastern direction while it is slowing down, the car does not reverse directions instantly.

2.20 – The two balls will pass each other above h/2 but will have the same speed. Let’s define the time the ball dropped from the tower as t1. Imagine the position over time graph of just the ball that was dropped from the tower, it has a y intercept of (0, h) and an x intercept of (t1, 0) with a concave down decreasing curve connecting the intercepts. If we assume the effects of gravity are constant and the ball is in a perfect vacuum, it stands to reason that the curvature of the curve is constant as the rate the height is decreasing is increasing by a constant factor. Now reflect that curve over the line at t = t1/2. This curve has a y-intercept of (0, 0) and has the point (h, t1). It also has the same rate of curvature as the first curve which is proportional to and caused by the force of gravity. This object this curve represent starts at the ground with its highest velocity and has its velocity decreased by the force of gravity until it ends up at the height of the tower with no velocity. This curve represents the ball that started at the ground while remaining a direct reflection of the curve of the ball dropped from the tower. Since both balls have a slower velocity when above h/2 than below h/2, they reach the midpoint of their travels (when they intersect as defined by the line of reflection) closer to the top of their paths meaning they cross above h/2. Since they are described by the same curve that is reflected about a vertical line, the magnitude of their velocities are equal at the line of reflection.