Position, Velocity, Acceleration … Set 1

Applications (Position, Velocity & Acceleration) Worksheet

Solve each of the following applications.

1. The position equation of the movement of a particle is given by $s = (t^2 - 1)^3$ where *s* is measured in feet and *t* is measured in seconds. Find the acceleration at 2 seconds.

2. Suppose the position equation of a moving object is given by $s(t) = 3t^2 + 2t + 5$ where *s* is measured in meters and *t* is measured in seconds. Find the velocity of the object when t = 2.

3. An object is thrown downward from the top of a 220 ft. building with an initial velocity of 26 ft/sec. Write the position equation for the movement described. What is the velocity at 1 second?

4. A particle moves in a straight line according to the law of motion: $s = t^3 - 4t^2 - 3t$. When the velocity of the particle is zero, what is the acceleration?

5. At t = 0, a rock is dropped from rest atop a 256 ft high building. When, and with what velocity does it strike the ground?

6. A rocket is shot vertically from the ground with an initial velocity of 608 ft/sec. When does the rocket reach its maximum height, and what is the maximum height? When does the rocket hit the ground?

7. A stone is thrown straight down from the top of an 80 ft tower. If the initial speed is 64 ft/sec, how long does it take to hit the ground, and with what speed?

8. A rocket is shot vertically from the ground and reaches a height of 256 ft after 2 sec. What was its initial velocity, what will be its maximum height, and when does it reach its maximum height?

9. A car is moving along a straight road according to the equation: $s = 2t^3 - 3t^2 - 12t$. Describe its motion by indicating when the car is moving to the right, and when it is moving to the left.

10. A rock is dropped down a well that is 256 ft deep. When will it hit the bottom of the well?

11. A rock is thrown straight down from a height of 480 ft with an initial velocity of 16 ft/sec. How long does it take to hit the ground? With what speed does it hit the ground? How long does it take before the rock is moving at a speed of 112 ft/sec? When has the rock traveled a distance of 60 ft?

12. A rocket is shot straight up from the ground. What must have been its initial velocity if it returned to the earth in 20 seconds?

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Answers

1. $a = 342\ ft/sec^2$

2. $v(t) = 14\ m/s$

3. $s(t) = -16t^2 - 26t + 220$
   $v(t) = 58\ ft/sec$ downward

4. $a = 10$

5. $t = 4\ sec$ with a velocity of $128\ ft/sec$ downward

6. reaches max height at $t = 19\ sec$; max height is $5776\ ft$

7. $t = 1\ sec$ with a speed of $96\ m/sec$ downward

8. $v_0 = 160\ ft/sec$; reaches max height of $400\ ft$ at $t = 5\ sec$

9. left: $[0,2)$ & right: $(2,\infty)$

10. $t = 4\ sec$

11. $t = 5\ sec$ with a speed of $176\ ft/sec$ downward; it takes $3\ sec$; traveled 60 ft at $t = \frac{3}{2}\ sec$

12. $v_0 = 320\ ft/sec$