1. (1 pt) A particle moves along a straight line and its position at time \( t \) is given by \( s(t) = 2t^3 - 21t^2 + 36t \) where \( s \) is measured in feet and \( t \) in seconds.

Find the velocity (in ft/sec) of the particle at time \( t = 0 \): __________

The particle stops moving (i.e. is in a rest) twice, once when \( t = A \) and again when \( t = B \) where \( A < B \). \( A \) is __________ and \( B \) is __________.

What is the position of the particle at time 14? __________

Finally, what is the TOTAL distance the particle travels between time 0 and time 14? __________

2. (1 pt) If a ball is thrown vertically upward from the roof of 64 foot building with a velocity of 112 ft/sec, its height after \( t \) seconds is \( s(t) = 64 + 112t - 16t^2 \). What is the maximum height the ball reaches? __________

What is the velocity of the ball when it hits the ground (height 0)? __________

3. (1 pt) The area of a square with side \( s \) is \( A(s) = s^2 \). What is the rate of change of the area of a square with respect to its side length when \( s = 14 \)? __________

4. (1 pt) The population of a slowly growing bacterial colony after \( t \) hours is given by \( p(t) = 5t^2 + 30t + 150 \). Find the growth rate after 4 hours. __________

5. (1 pt) The cost of producing \( x \) units of stuffed alligator toys is \( c(x) = 0.004x^2 + 10x + 7000 \). Find the marginal cost at the production level of 1000 units. __________

6. (1 pt) A mass attached to a vertical spring has position function given by \( s(t) = 3 \sin(3t) \) where \( t \) is measured in seconds and \( s \) in inches.

Find the velocity at time \( t = 1 \). __________

Find the acceleration at time \( t = 1 \). __________

7. (1 pt) The mass of the part of a rod that lies between its left end and a point \( x \) meters to the right is \( 1x^4 \) kg. The linear density of the rod at 3 meters is __________ kg/meter and at 3 meters the density is __________ kg/meter.

8. (1 pt) If \( f \) is the focal length of a convex lens and an object is placed at a distance \( p \) from the lens, then its image will be at a distance \( q \) from the lens, where \( f, p, \) and \( q \) are related by the lens equation

\[
\frac{1}{f} = \frac{1}{p} + \frac{1}{q}
\]

What is the rate of change of \( p \) with respect to \( q \) if \( q = 2 \) and \( f = 6 \)? (Make sure you have the correct sign for the rate.) __________

9. (1 pt) A particle moves along a straight line with equation of motion \( s = t^6 - 5t^3 \) Find the value of \( t \) (other than 0) at which the acceleration is equal to zero. __________