Calculus Worksheet #4 Unit 4 page 1 _____

Answer each of the following questions.

1. A particle moving on a line will be s feet from a fixed point P after t seconds where $s = f(t) = 12t^2 - 3t^3$, $t \geq 0$. (Note that if $s < 0$, then the particle is to the left of point P, and if $s > 0$, then the particle is to the right of point P.)

a. Express the velocity, v, and the acceleration, a, as a function of t.

v = _____ a = _____

b. Fill out the table below giving the position relative to point P, the velocity, and the acceleration of the particle at the indicated times.

t	s	v	a
0			
1			
2			
3			
4			
5			

2. A particle moving on a straight line starts from rest at point P. Its acceleration, a, after t seconds is given by the equation $a = 4 - 3t$ (ft/s^2) where $t \geq 0$.

a. Express the velocity, v, of the particle as a function of t. v = _____

b. Express the distance, s, that the particle is from point P as a function of t.

s = _____

c. When will the particle again be at rest? How far from point P is it then?

d. When will the particle again be at point P? How fast will it be moving then?

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Answer each of the following questions.

3. The velocity at time t of a particle moving on a straight line is $v = 3t^2 - 9t + 6$ (fps) where $t \geq 0$.

a. Express the acceleration, a, of the particle as a function of t. a = _____

b. Find the acceleration of the particle when t = 3s.

c. If s is the distance that the particle is from its starting point, then express s as a function of t.

s = _____

d. When will the particle be at rest? What is its position when it is at rest relative to its starting point?

e. How far does the particle move from t = 3s to t = 5s?

4. A helicopter is moving straight up at a constant rate of 10 feet per second. When it is 150 feet above the ground, a steel ball is dropped out the door. Assume the acceleration due to gravity is a constant 32 feet per second per second when you answer the following questions.

a. Let v be the velocity of the ball and let s be the distance the ball is above the ground. Express both as a function of t, where t is the time in seconds since the ball was dropped. (For the sake of simplicity, neglect air resistance.)

v = _____ s = _____

b. When will the ball hit the ground (3 significant digits)?

c. How fast will the ball be moving as it hits the ground (3 significant digits)?