Unit 3: Motion Analyzed by Calculus WS #2

Name: _____ **Date:** _____ **Period:** _____

Show all work; circle final answer.

An object moves along a horizontal line, and its position at time t is $x(t) = t^3 - 6t^2 + 9t + 15$ where $t \geq 0$.

$v(t) =$

$a(t) =$

$v(t)$: $\longleftrightarrow$

$a(t)$: $\longleftrightarrow$

1) Find the times when the object is at rest.

2) When is the velocity of the object increasing?

3) When is the speed of the object increasing?

4) When is its acceleration positive?

5) When is the object moving to the left?

6) What is the minimum value of the speed?

7) What is the average velocity on $[0,2]$?

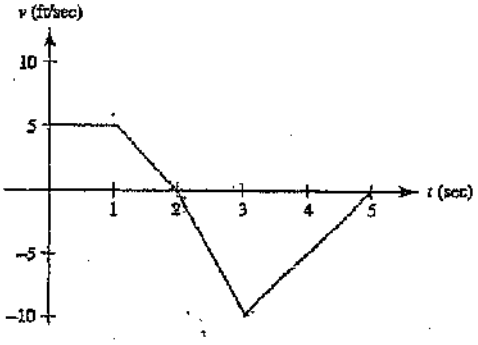
8) What is the total distance traveled on $[0,2]$?

9) What is the displacement on $[0,2]$?

10) When is the object farthest to the left? Justify.

11) When is the object farthest to the right? Justify.

Answer the following using the velocity graph for an object moving along a straight line during the time interval $[0,5]$.



12) The object attains its maximum speed when $t =$ ___?

13) The speed of the object is increasing during what time interval?

14) The acceleration of the object is positive during what interval?

15) How many times on $(0,5)$ is the object's acceleration undefined?

16) During the interval $(2,3)$, what is the object's acceleration (in ft/sec^2)?

17) The object is furthest to the right when $t =$ ___?

18) The object reverses direction at $t =$ ___?

19) What is the object's average acceleration (in ft/sec^2) for the interval $[0,3]$?

For the following, an object moves along a vertical line according to the position function given by $y(t) = 2t^3 - 21t^2 + 60t + 3$ for $t \geq 0$.

$v(t) =$ $a(t) =$

$v(t)$: $a(t)$:

20) When is the object traveling downward?

21) When is the object traveling upward?

22) When is the object back at the starting point? How do you know this?

23) What is the object's minimum velocity on $[0,5]$?

24) What is the object's average velocity on $[0,6]$?

25) When does the instantaneous velocity equal the average velocity on $[0,3]$?

26) When is the object farthest up?

27) What is the total distance traveled on $[0,7]$?

28) What is the displacement on $[0,7]$?

29) When is the object's velocity increasing?

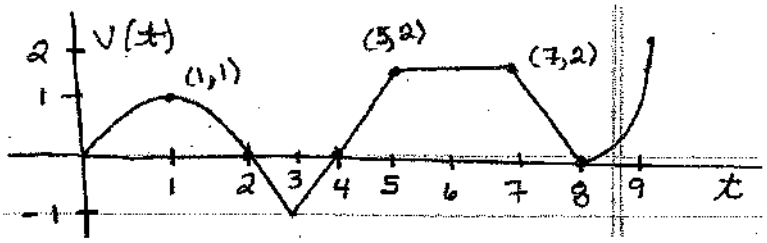
30) When is the object's speed increasing?

Using the velocity graph on $[0, 9]$ to the right, answer the following:

31) When is the particle moving to the left?

32) When is the particle moving to the right?

33) When is the acceleration of the particle undefined?



34) When is the particle at rest?

35) When does the particle change direction?

36) What is the particle's acceleration on $(3,5)$?

37) What is the particle's average velocity on $[5,7]$?

38) When is the particle's velocity increasing?

39) When is the particle speeding up?

40) When is the speed of the particle decreasing?