Calculus Name_____

Assignment

Date_____ Period____

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity function $v(t)$, the acceleration function $a(t)$, and the times t when the acceleration is 0.

1) $s(t) = -t^3 + 11t^2 - 24t$

2) $s(t) = t^3 - 20t^2 + 100t$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity function $v(t)$, the acceleration function $a(t)$, and the intervals of time when the particle is moving left and moving right.

3) $s(t) = -t^3 + 24t^2 - 144t$

4) $s(t) = t^3 - 24t^2 + 144t$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity function $v(t)$, the acceleration function $a(t)$, and the intervals of time when the particle is slowing down and speeding up.

5) $s(t) = t^3 - 26t^2 + 169t$

6) $s(t) = -t^3 + 10t^2$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity, speed, and acceleration at the given value for t.

7) $s(t) = t^3 - 13t^2$; at $t = 2$

8) $s(t) = t^3 - 9t^2$; at $t = 7$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the times t when the particle changes directions.

9) $s(t) = t^3 - 13t^2 + 40t$

A) Changes direction at: $t = \left\{\frac{14}{3}\right\}$

B) Changes direction at: $t = \left\{2, \frac{20}{3}\right\}$

C) Changes direction at: $t = \{6\}$

D) Changes direction at: $t = \{5, 15\}$

10) $s(t) = -t^3 + 13t^2$

A) Changes direction at: $t = \left\{\frac{28}{3}\right\}$

B) Changes direction at: $t = \{5, 15\}$

C) Changes direction at: $t = \left\{\frac{14}{3}, 14\right\}$

D) Changes direction at: $t = \left\{\frac{26}{3}\right\}$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the times t when the acceleration is 0.

11) $s(t) = -t^4 + 11t^3$

A) Acceleration zero at: $t = \{5\}$

B) Acceleration zero at: $t = \left\{\frac{9}{2}\right\}$

C) Acceleration zero at: $t = \left\{0, \frac{11}{2}\right\}$

D) Acceleration zero at: $t = \{4\}$

12) $s(t) = -t^4 + 15t^3$

A) Acceleration zero at: $t = \left\{\frac{9}{2}\right\}$

B) Acceleration zero at: $t = \left\{0, \frac{15}{2}\right\}$

C) Acceleration zero at: $t = \left\{\frac{15}{2}\right\}$

D) Acceleration zero at: $t = \{7\}$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the intervals of time when the particle is slowing down and speeding up.

13) $s(t) = -t^4 + 8t^3$

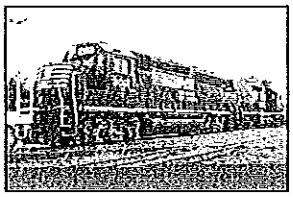
A) Slowing down: $4 < t < 6$, Speeding up: $0 < t < 4, t > 6$

B) Slowing down: $\frac{15}{2} < t < \frac{45}{4}$, Speeding up: $0 < t < \frac{15}{2}, t > \frac{45}{4}$

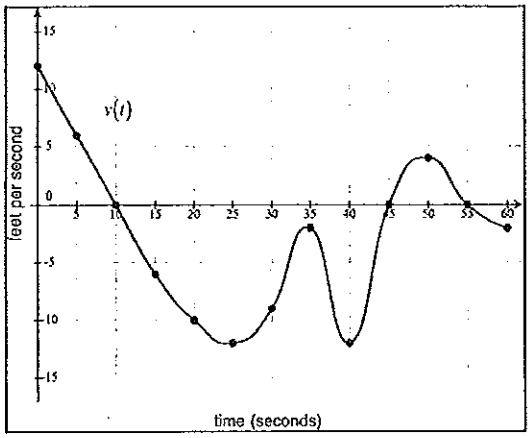
C) Slowing down: $7 < t < \frac{21}{2}$, Speeding up: $0 < t < 7, t > \frac{21}{2}$

D) Slowing down: $\frac{9}{2} < t < \frac{27}{4}$, Speeding up: $0 < t < \frac{9}{2}, t > \frac{27}{4}$

Name _____



A railroad engine is being positioned in a train yard over straight track. Its velocity is shown in the graph below in 5-second intervals as well as in a table of values. The graph is linear between $t = 0$ and $t = 15$ and has horizontal tangent lines at $t = 25$, $t = 35$, $t = 40$, and $t = 50$. At $t = 0$, the engine is in front of a control tower.



t (seconds)	$v(t)$ ft per second
0	12
5	6
10	0
15	-6
20	-10
25	-12
30	-9
35	-2
40	-12
45	0
50	4
55	0
60	-2

a. At what values of t does the engine have no acceleration?

b. Write an expression for the speed of the engine from $0 \le t \le 15$.

c. Give an approximation for the acceleration for the engine at $t = 30$. Specify units.

d. For what values of t is the engine speeding up? Explain your reasoning.

e. At what value of t is the engine the farthest from the control tower? Explain your answer.