Section 3.8

Example: The position of a particle is given by the equation $s = f(t) = t^3 - 6t^2 + 9t$ where t is measured in seconds and s in meters.

a) Find the velocity at time t.

$v(t) = 3t^2 - 12t + 9$

b) What is the velocity after 2 s? After 4 s?

$V(2) = -3$ m/s

$v(4) = 9$ m/s

c) When is the particle at rest?

$v(t) = 0$ so $3(t^2 - 4t + 3) = 0$

at 1s & 3s $3(t-3)(t-1) = 0$

d) When is the particle moving forward?

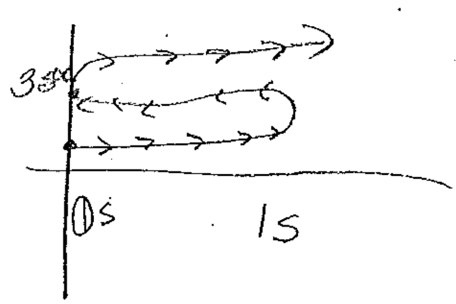
$v(t) = +$ $t-3>0$ $t-1>0$

$t>3$ $t>1$

$(3, \infty)$ moving forward

$(0, 1)$

e) Draw a diagram to represent the motion of the particle.



f) Find the total distance traveled by the particle during the first five seconds.

$s(1) - s(0) = 4 - 0$

$s(3) - s(1) = 0 - 4$ $\Big\}+$ $28\,m$

$s(5) - s(3) = 20 - 0$

g) Find the acceleration at time *t* and after 4 s.

$6t - 12 = a(t)$

$a(4) = 12\,m/s^2$

h) On your calculator, graph *s, v,* and *a* using the window x = [0, 5] scale of 1, y = [-15, 25] scale of 5.

When the velocity and the acceleration are either both positive or both negative, the particle is speeding up. When *v* and *a* have opposite signs, the particle is slowing down.

i) When is the particle speeding up? Slowing down?

$a(t) = 6t - 12 > 0$ when $t > 2$ $+ (2, \infty)$

$6t - 12 < 0$ when $t < 2$ $- (0, 2)$

So su $(1,2)$ $(3, \infty)$

sd $(0,1)$ $(2,3)$

237 (1, 5-7)

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Section 3.8 day 2

Cost Function: the total cost a company incurs in producing *x* units of a certain commodity defined by $f(x)$.

Marginal Cost: the instantaneous rate of change in cost with respect to the number of items produced. (the derivative).

Example: A company produces baseball caps and estimates the cost of producing *x* baseball caps is $C(x) = 10{,}000 + 5x + 0.01x^2$.

a. Find the marginal cost function
b. Find $C'(500)$ and explain what it means. What does it predict?
c. Compare $C'(500)$ with the cost of manufacturing the 501^{st} cap.

a) $C'(x) = 5 + .02x$

b) $C'(500) = 5 + .02(500) = \$15/\text{cap}$ - rate \$ is increasing with respect to x when x = 500
predicts the 501 st cap cost.

c) $C(501) - C(500) = \$15.01$
$15015.01 - 15000$

8, 9, 11, 13ab, 14, 15, 18, 29, 30

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