(30)

7. The position function of a particle moving on a coordinate line is given by: $x(t) = 2t^3 - 21t^2 + 60t + 3$, where x is in feet and t is in seconds.

a) When is the particle at rest? $*v(t) = 0$

$v(t) = 6t^2 - 42t + 60$

$0 = 6(t^2 - 7t + 10)$

$0 = 6(t-2)(t-5)$

$t = 2, 5$ secs.

b) When does the particle reverse direction?

$v(t)$: + | 2 | − | 5 | +

$t = 2, 5$ secs. b/c $v(t)$ change signs.

c) What is the velocity when the acceleration is zero?

$a(t) = 12t - 42$

$0 = 6(2t - 7)$

$2t - 7 = 0$

$t = 7/2$

$v(t) = 6(1.5)(-1.5)$

-13.5 ft/s

d) What is the speed when the acceleration is 6 ft/sec? velocity

$6 = 12t - 42$

$48 = 12t$

$t = 4$

$v(4) = 6(2)(-1) = -12$ ft/s

speed = 12 ft/s

e) What is the displacement from $t = 1$ to $t = 3$?

$x(1) = 44$

$x(3) = 48$

final pos. − initial pos.

$x(3) - x(1)$

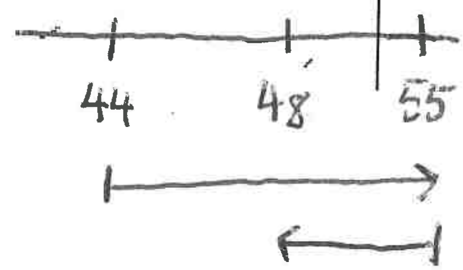
$48 - 44 = 4$ ft

f) What is the total distance moved from $t = 1$ to $t = 3$?

$x(1) = 44$ ⟩ 11

$x(2) = 55$ ⟩ 7

$x(3) = 48$



18 feet

(34) PVA Quiz Review Problem

position

$s(2) = 40$ m

$s(4) = 10$ m

$v(2) = -15$ m/s

$v(4) = -12$ m/s

$v(6) = -4$ m/s

$a(4) = 3$ m/s²

$a(6) = 7$ m/s²

Find the following:

a) Average velocity on [2,4]

b) Instantaneous velocity at $t=4$

c) Is velocity positive or negative at $t=4$?

d) Is velocity increasing or decreasing at $t=4$?

e) Is speed increasing or decreasing at $t=4$?

f) Find average acceleration on [4,6]

a) avg. velocity $= \frac{\text{change in position}}{\text{change in time}} = \frac{s(4) - s(2)}{4 - 2} \rightarrow \frac{40 - 10}{2} = \frac{30}{2} = 15$ m/s

b) Instantaneous velocity → $v(4) = -12$ m/s

c) $v(4) < 0$

d) $a(4) = 3$, velocity is increasing since $a(4) > 0$

e) speed is decreasing since $v(t)$, $a(t)$ have opposite signs

f) avg. acceleration $= \frac{\text{change in velocity}}{\text{change in time}} \rightarrow \frac{v(6) - v(4)}{6 - 4} \rightarrow \frac{-4 - -12}{2} = \frac{8}{2} = 4$ m/s²

2) Find $\frac{dy}{dx}$ $\quad y = 3(x-1)^2 + \frac{2\pi x}{\sqrt{11}} - \frac{4}{3(\sqrt{x^5})} + 4e^2 - 5$

$(x-1)(x-1)$

$3(x^2-2x+1)$

$$y = 3x^2 - 6x + 3 + \frac{2\pi}{\sqrt{11}}x - \frac{4}{3}x^{-5/2} + 4e^2 - 5$$

$$\frac{dy}{dx} = 6x - 6 + 0 + \frac{2\pi}{\sqrt{11}} - \frac{-5}{2}\cdot\frac{4}{3}x^{-7/2} + 0 - 0$$

$$\boxed{\frac{dy}{dx} = 6x - 6 + \frac{2\pi}{\sqrt{11}} + \frac{10}{3x^{7/2}}}$$

$$y = \frac{3\sqrt{x}(x^2-1)}{4(\sqrt{x^5})}$$

$$y = \frac{3x^{1/2}(x^2-1)}{4x^{5/2}} \rightarrow \frac{3x^{3/2}}{4x^{5/2}} - \frac{3x^{1/2}}{4x^{5/2}}$$

$$y = \frac{3}{4}x^{-1} - \frac{3}{4}x^{-2}$$

$$\frac{dy}{dx} = \frac{-3}{4}x^{-2} - -2\cdot\frac{3}{4}x^{-3}$$

$$\boxed{\frac{dy}{dx} = \frac{-3}{4x^2} + \frac{3}{2x^3}}$$

(30)

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a) When is the particle at rest?

b) When does the particle reverse direction?

c) What is the velocity when the acceleration is zero?

d) What is the speed when the acceleration is 6 ft/sec?

e) What is the displacement from $t = 1$ to $t = 3$?

f) What is the total distance moved from $t = 1$ to $t = 3$?

(34) PVA Quiz Review Problem

Given:

$s(2) = 40$ m
$s(4) = 10$ m
$v(2) = -15$ m/s
$v(4) = -12$ m/s
$v(6) = -4$ m/s
$a(4) = 3$ m/s^2
$a(6) = 7$ m/s^2

Find the following:

a) Average velocity on $[2, 4]$
b) Instantaneous velocity at $t = 4$
c) Is velocity positive or negative at $t = 4$?
d) Is velocity increasing or decreasing at $t = 4$?
e) Is speed increasing or decreasing at $t = 4$?
f) Find average acceleration on $[4, 6]$