p. 137 (19) A particle moves along a line so that its position at any time $t \geq 0$ is given by the function $s(t) = t^2 - 3t + 2$ where s is measured in meters and t is measured in seconds.

a) Find the displacement during the first 5 seconds.

Δy or Δs

b) Find the average velocity during the first 5 seconds.

slope

c) Find the instantaneous velocity when $t = 4$.

$s'(t)$

d) Find the acceleration of the particle when $t = 4$.

$s''(t) = v'(t)$

e) At what values of t does the particle change direction?

$v(t) = 0$

$2t - 3 = 0$

$t = \frac{3}{2}$ sec

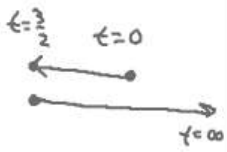
$s(t) = t^2 - 3t + 2$

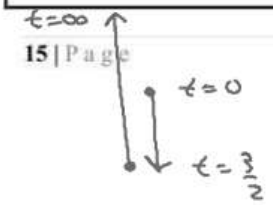
$v(t) = 2t - 3$

f) Describe the particles motion

$(0, \frac{3}{2})$ $v(1) = -1 < 0$ moving left/down

$(\frac{3}{2}, \infty)$ $v(2) = 1 > 0$ moving right/up





a) Find the body's velocity, speed, and acceleration at time t.

b) Find the the body's velocity, speed, and acceleration at time $t = \frac{\pi}{4}$

position

Part a

15. $s(t) = 2\sin t + 3\cos t$

$v(t) = 2\cos t - 3\sin t$

$a(t) = -2\sin t - 3\cos t$

$\text{speed} = |v(t)|$

$= |2\cos t - 3\sin t|$

Part B

$v(\pi/4) = 2\cos \pi/4 - 3\sin \pi/4$

$= 2\left(\frac{\sqrt{2}}{2}\right) - 3\left(\frac{\sqrt{2}}{2}\right)$

$a(\pi/4) = -2\sin(\pi/4) - 3\cos(\pi/4)$

$= -2\left(\frac{\sqrt{2}}{2}\right) - 3\left(\frac{\sqrt{2}}{2}\right)$

$\text{speed} = \left|\frac{2\sqrt{2}}{2} - \frac{3\sqrt{2}}{2}\right|$