A particle is moving along the *x*-axis so that at a time *t* (in seconds), it is at a position
$x=-t^{2}+4t-1 $(in metres).
a) Find its average velocity in the first 3 seconds.

b) Find its instantaneous velocity as a function of *t*.

c) In which direction is it moving at time $t=1$?

d) On which side of the origin is it at time $t=1$?

e) At what time(s) is the particle changing direction?