1) A particle is moving with its position defined by $s(t) = 2t^3 + 3t^2 - 20t + 6$ where t is in seconds and s is in feet.

    a) What are the particle's velocity and acceleration functions?

    b) What is the total distance traveled by the particle in the first three seconds?

    c) What is the displacement of the particle after the first eight seconds?

a) $s(t) = 2t^3 + 3t^2 - 20t + 6$

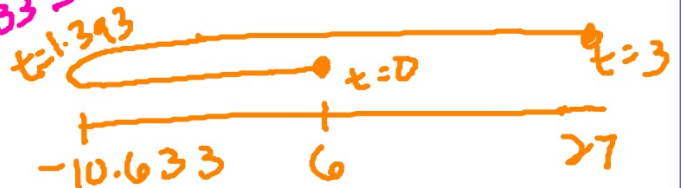$v(t) = 6t^2 + 6t - 20$

$a(t) = 12t + 6$

b) $s(0) = 6$ ft.

$s(1.393) = -10.633$ ft.

$s(3) = 27$ ft.

16.633
37.633
$\boxed{54.266 ft}$

$t = 1.393$

$6t^2 + 6t - 20 = 0$

$t = 1.393$

$-10.633 \qquad 6 \qquad 27$

$t = 1.393 \qquad t = 0 \qquad t = 3$

c) Displacement 0 → 8 sec.

$s(0) = 6$ ft.

$s(8) = 1062$ ft.

$\boxed{1,056 ft \text{ to the right}}$

2) A silver dollar is dropped from a building that is 1,362 feet
in height. Time is in seconds.

    a) What are the silver dollar's height, velocity and
    acceleration functions?

    b) When does the silver dollar hit the ground and what is
    its impact velocity?

    c) How far does the silver dollar travel between $t=1$
    second and $t=2$ seconds?

a) $s(t) = -16t^2 + 1362$

$v(t) = -32t$

$a(t) = -32$

b) $-16t^2 + 1362 = 0$

$$t = 9.226 \text{ sec}$$

$$v(9.226) = -295.232 \text{ ft/sec}$$

c) $s(1) = 1346$

$s(2) = 1298$ $\Big)$ $\boxed{48 \text{ ft}}$

1 : 1346
2 : 1298
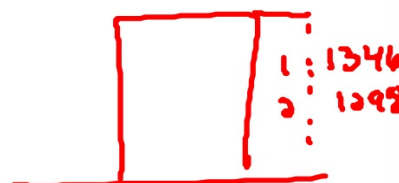
3) The displacement in feet of a body moving along a line at any time t in seconds is given by $s(t) = t^3 - 7t^2 + 8t + 4$.

   a) What are the velocity and acceleration functions?

   b) Find the total distance traveled from $t = 0$ second to $t = 5$ seconds.

   c) What is the velocity of the body when the position is 8 feet?

   d) Sketch a motion schematic. Be sure to label the time, position, and velocity at each change and at the beginning.
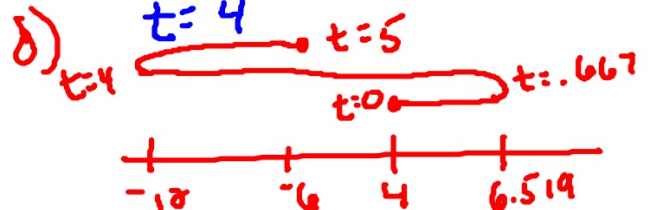
a) $v(t) = 3t^2 - 14t + 8$

   $a(t) = 6t - 14$

$3t^2 - 14t + 8 = 0$

$t = .667$

$t = 4$

b) $s(0) = 4$

$s(.667) = 6.519$ ⟩ 2.519

$s(4) = -12$ ⟩ 18.519

$s(5) = -6$ ⟩ 6

$\boxed{27.038 \text{ ft.}}$

c) $t^3 - 7t^2 + 8t + 4 = 8$

   $t = 5.725 \text{ sec.}$

$\boxed{v(5.725) = 26.177 \text{ ft/sec}}$

d)

4) A marble is thrown straight down from the top of a 220-foot building. Its initial velocity was 22 feet per second.
   a) What are the marble's height, velocity, and acceleration functions?
   b) When does the marble hit the ground and what is its impact velocity?
   c) What are the velocity and position at three seconds?
   d) What is its velocity after falling 108 feet?

a) $s(t) = -16t^2 - 22t + 220$
$v(t) = -32t - 22$
$a(t) = -32$

d) $-16t^2 - 22t + 220 = 112$
$t = 2 \text{ sec}$
$v(2) = -86 \text{ ft/sec}$

b) $-16t^2 - 22t + 220 = 0$
$t = 3.084 \text{ sec.}$
$v(3.084) = -120.688 \text{ ft/sec}$

c) $s(3) = 10 \text{ ft}$
$v(3) = -118 \text{ ft/sec.}$

An object has its position defined by $s(t) = t^3 - 5t^2 + 5t + 2$ feet. Time is in seconds.

  a) What are the velocity and acceleration functions?
  b) What is the total distance traveled by the object during the first eight seconds?
  c) What is the displacement of the object after the first eight seconds?
  d) What is the position when the velocity is 3.1 feet per second?
  e) What is the velocity when the acceleration in -2.7 feet per second²?

bag of sugar is launched vertically upward from a height
5 feet with an initial velocity of 102 feet per seconds.
) What are the bag's height, velocity, and acceleration
unctions?
) What is the position of the bag when the velocity is 22
eet per second?
) When will the bag hit the ground? What is its impact
elocity?
l) When will the bag reach its maximum height? What is
ts maximum height?