ıe second derivative of a function is $f''(x) = 12x^2 - 12x$.

ı: $f'(2) = 9$ and $f(1) = -1$, find the first derivative and original fu

$f'(x) = 4x^3 - 6x^2 + c$

$9 = 4(2)^3 - 6(2)^2 + c$

$9 = 8 + c$

$1 = c$

$$\boxed{f'(x) = 4x^3 - 6x^2 + 1}$$

$f(x) = x^4 - 2x^3 + x + c$

$-1 = 1^4 - 2(1)^3 + 1 + c$

$-1 = c$

$$\boxed{f(x) = x^4 - 2x^3 + x - 1}$$

e acceleration of a projectile is -32 feet per second per second. At five seconds
ity of the object is -50 feet per second. At seven seconds, the position of the
1 feet.

a) What are the velocity and position functions?

$$a(t) = -32$$

$$v(t) = -32t + c$$

$$-50 = -32(5) + c$$

$$\boxed{v(t) = -32t + 110}$$

$$p(t) = s(t) = -16t^2 + 110t + c$$

$$181 = -16(7)^2 + 110(7) + c$$

$$\boxed{p(t) = -16t^2 + 110t + 195}$$

What are the initial velocity and position of the object?

$$v(0) = 110 \text{ ft/sec}$$
$$p(0) = 195 \text{ ft}$$

When does the object reach its maximum height and what is its maximum height?

$$v(t) = -32t + 110 = 0 \qquad p(3.438) =$$
$$t = 3.438 \text{ sec.} \qquad\qquad 384.062 \text{ ft}$$

When did it hit the ground and what was its impact velocity?

$$p(t) = -16t^2 + 110t + 195 = 0 \qquad v(8.337) =$$
$$t = 8.337 \text{ sec.} \qquad\qquad\qquad -156.784$$
$$\text{ft/sec}$$

hat are the total distance traveled and the displacement of the object?

Displacement

$$\int_0^{8.33} (-32t + 110)\, dt$$

fn Int$((-32x + 110), x, 0, 8.337)$

$\boxed{-195.019\ ft}$

Total Distance

$$\int_0^{8.337} |-32t + 110|\, dt$$

fn Int$((abs(-32x + 110)), x, 0, 8.$

$\boxed{573.144\ ft}$

object with rectilinear motion has an acceleration function: $a(t) = t^2 - 3t - 1$. Th

t has a velocity of 13 feet per second at six seconds. It has a position of -2.25

ee seconds.

a) What are the velocity and position functions?

$$v(t) = \frac{1}{3}t^3 - \frac{3}{2}t^2 - t + c$$

$$13 = \frac{1}{3} \cdot 6^3 - \frac{3}{2} \cdot 6^2 - 6 + c$$

$$\boxed{v(t) = \frac{1}{3}t^3 - \frac{3}{2}t^2 - t + 1}$$

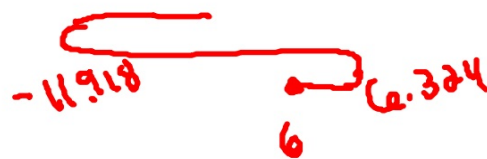$$p(t) = \frac{1}{12}t^4 - \frac{1}{2}t^3 - \frac{1}{2}t^2 + t + c$$

$$-2.25 = \frac{1}{12}(3)^4 - \frac{1}{2}(3)^3 - \frac{1}{2}(3)^2 + 3 + c$$

$$\boxed{p(t) = \frac{1}{12}t^4 - \frac{1}{2}t^3 - \frac{1}{2}t^2 + t + 6}$$

What are the initial velocity and position of the object?

$$v(0) = 1 \text{ ft/sec}$$

$$p(0) = 6 \text{ ft}$$

-11.918   6.324

6

When is the object at rest? What is its position at those time(s)?

$$v(t) = \frac{1}{3}t^3 - \frac{3}{2}t^2 - t + 1 = 0$$

$$t = .572 \text{ sec}$$

$$t = 4.981 \text{ sec}$$

$$p(.572) = 6.324$$

$$p(4.981) = ^-11.918$$

What are the acceleration, the velocity and the position of the object at 5.6 onds?

$$p(5.6) = -9.934 \text{ ft}$$

$$v(5.6) = 6.899 \text{ ft/sec}$$

$$a(t) = 13.56 \text{ ft/sec}^2$$

What are the total distance traveled and the displacement of the object in the first six seconds?

Displacement

$$\int_0^6 \left(\tfrac{1}{3}t^3 - \tfrac{3}{2}t^2 - t + 1\right) dt \quad = \quad \boxed{-12 \, ft}$$

Total Distance

$$\int_0^6 \left| \tfrac{1}{3}t^3 - \tfrac{3}{2}t^2 - t + 1\right) dt \quad = \quad 24,484 \, ft.$$

fnInt$\left(\left(abs((1\div 3)x^3 - 1.5x^2 - x + 1)\right), x, 0, 6\right)$