(8) An object moving on a straight line is $s(t) = \frac{t}{t^2+1}$ feet from its starting point at time t. What is its acceleration when its velocity is 0 ft/sec?

Velocity $= V(t) = s'(t) = \frac{1\cdot(t^2+1) - t\cdot 2t}{(t^2+1)^2} = \frac{1-t^2}{(t^2+1)^2}$

$= \frac{(1-t)(1+t)}{(t^2+1)^2}$, Thus the velocity is 0 at times $t=1$ and $t=-1$ seconds. Since we're assuming time is not negative, the velocity is 0 at time $t=1$

Now, acceleration is $V'(t) = \frac{-2t(t^2+1)^2 - (1-t^2)2(t^2+1)2t}{(t^2+1)^4}$

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

Acceleration at time $t=1$ is $V'(1) = \frac{-2(1^2+1)^2 - 4(1-1^2)}{(1+1)^3} = -1 \text{ ft/sec}^2$

(22) $f(x) =$ (# of liters of fuel when rocket is x miles high)

$f'(x) =$ rate of change of liters of fuel, in liters/mile.

$f'(20) = -8$ means when rocket is 20 miles is high it is using fuel at a rate of 8 liters per mile. In going from 20 to 21 miles high, expect to use 8 liters of fuel.