18 p 277

0 to 200 mph in 30 seconds

$$\frac{200 \text{ miles}}{\text{hr}} \cdot \frac{1 \text{ hr}}{3600 \text{ sec}} = \frac{1}{18} \frac{\text{mi}}{\text{sec}}$$

$$a(t) = \frac{\frac{1}{18} - 0}{30 - 0} = \frac{1}{540} \frac{\text{mi}}{\text{sec}^2}$$

$$v(t) = \frac{1}{540}t + C \Rightarrow v(t) = \frac{1}{540}t$$

↑ from rest so $C = 0$

$$x(t) = \frac{1}{540}\frac{t^2}{2} + C = \frac{t^2}{1080}$$

↑ $C = 0$

$\Rightarrow$ 30 seconds until take off

so $x(30) = \frac{30^2}{1080} = \frac{900}{1080} = \frac{5}{6}$ mi

Acceleration due to gravity on planet Scote is -18 ft/sec^2. A rock is thrown upward from a height of 72 ft ($h(0)$) with a velocity of 63 ft/sec ($v(0)$).

a) What are velocity and height functions?

b) What is the highest height of rock?

c) With what velocity does rock strike ground?

a) $a(t) = -18$

$v(t) = -18t + C = -18t + 63$

$h(t) = -\frac{18t^2}{2} + 63t + C = -9t^2 + 63t + 72$

b) Set $v = 0$, then plug into h

$-18t + 63 = 0$

$$-18t = -63$$

$$t = 3.5$$

$$h(3.5) = -9(3.5)^2 + 63(3.5) + 72 = 182.25 \text{ ft}$$

c) Set $h = 0$, then plug into v

$$-9t^2 + 63t + 72 = 0$$

$$-9(t^2 - 7t - 8) = 0$$

$$-9(t - 8)(t + 1) = 0$$

$$t = 8 \quad \cancel{t = -1}$$

$$v(8) = -18(8) + 63 = -81 \text{ ft/sec}$$