Prob. 81, Sec. 6.1

Denote the acceleration as $a(t)$, the velocity as $v(t)$, the distance as $d(t)$.
$a(t) = k$ (k a number, a constant - this is given)

$v'(t) = a(t)$
$v(0) = 0$ initial velocity is 0.

Thus v(t) is of the form $\int k dt = kt + C$. $v(0) = 0$, means $k0 + C = 0$, $C = 0$. This gives us the velocity, $v(t) = kt$.

$d'(t) = v(t)$
$d(0) = 0$ initial distance is 0.

Thus d(t) is of the form $\int kt dt = kt^2/2 + C$. $d(0) = 0$, means $k0^2/2 + C = 0$, $C = 0$. This gives us the distance, $d(t) = kt^2/2$.

Finally, denote T the take-off time. Then $240 = kT = v(T)$, and $800 = kT^2/2 = d(T)$. The former gives $T = 240/k$, and the latter

$$800 = k\left(\frac{240}{k}\right)^2.$$

Simplify, $800 = 57600/k$, and $k = 72 ft/sec^2$.