5. [12 points] A weather balloon is launched and heads straight up away from the ground. Let $R(t)$ be the height, in kilometers, of the balloon above the ground t minutes after its launch. The function $R(t)$ is invertible and differentiable.

t	1	3	9	18	35	45	60	63	86
$R(t)$	0.01	0.19	0.4	0.84	2.3	3	3.7	4.1	8.9

a. [2 points] On which of the following intervals could $R(t)$ be concave up on the entire interval? Circle **all** correct answers.

$[1, 9]$ $[3, 18]$ $[9, 35]$ NONE OF THESE

b. [2 points] Find the balloon's average velocity between times $t = 3$ and $t = 18$. Show work and *include units.*

Answer: _____

c. [3 points] Estimate the balloon's instantaneous velocity at $t = 63$. Show work and *include units.*

Answer: _____

d. [3 points] Estimate $(R^{-1})'(3)$. Show work and *include units.*

Answer: $(R^{-1})'(3) \approx$ _____

e. [2 points] Let $M(s)$ be the height, in meters, of the balloon above the ground s seconds after its launch. Find a formula for $M(s)$ in terms of R and s. (There are 1000 meters in one kilometer.)

Answer: $M(s) =$ _____