3. [13 points] A berry crop in Michigan has been invaded by fruit flies since 2010. In that year, it was estimated that there were 33 million fruit flies on the crop. Doctor Banner has been investigating the infestation and he discovered that the population of fruit flies increases exponentially. His records show that the population of fruit flies increased by 30% of its original size in the time period between 2010 and 2015.
Let $s(t)$ be the function which gives the number of fruit flies (in millions) in the crop t years after 2010. Your answers in parts a), b) and c) must be **exact** or accurate up to the first 4 decimals.

a. [4 points] What is the annual percent growth rate of $s(t)$?

Solution:

$$b^5 = 1.3$$
$$b = \sqrt[5]{1.3}$$
$$r = b - 1 = \sqrt[5]{1.3} - 1$$

Annual percent growth rate of $s(t)$=$\sqrt[5]{1.3} - 1 \approx 0.0538$

b. [2 points] Find a formula for the function $s(t)$.

Solution:

$$s(t) = 33(1.3)^{t/5}$$

c. [2 points] According to your formula for $s(t)$, how many fruit flies will there be in the crop in 2017?

Solution:

$$s(7) = 33(1.3)^{7/5} \text{ millions}$$

d. [5 points] Find the average rate of change of $s(t)$ between 2010 and 2017 and interpret your result in the context of this problem.

Solution: Average rate of change=

$$\text{Average rate of change}= \frac{33(1.3)^{7/5} - 33}{7} = 2.0924$$

On average, between 2010 and 2017, the number of fruit flies in the crop will increase by 2.0924 millions every year.