MATH 140: Quiz 1

Name:

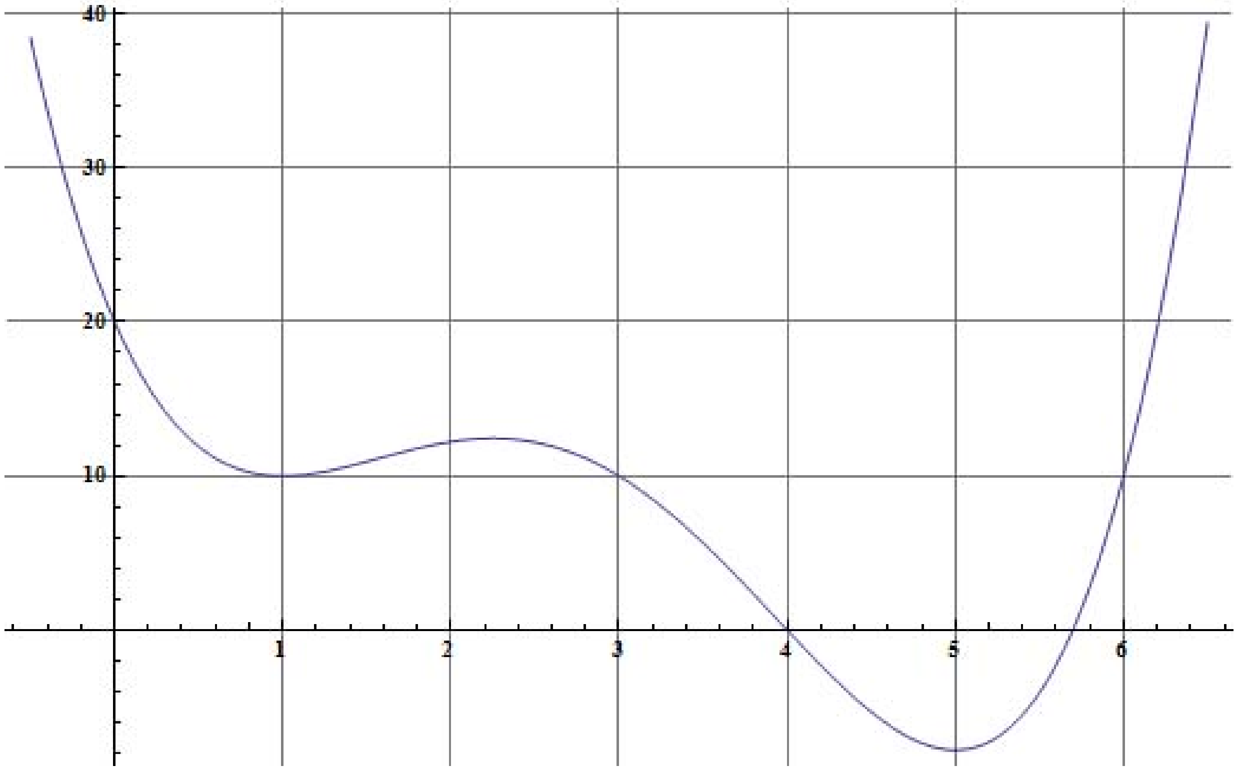
#1. In the year 1900, the star Fictious Maximus was measured to have a radius of 40 milllion miles. In 2005, the experiment was conducted again and the star was found to only have a radius of 10 million miles. Let R be the radius in millions of miles and t be the number of years since 1900.

i. (5 points) Give a formula for R in terms of t assuming the star is decaying linearly.

ii. (5 points) Give a formula for R in terms of t assuming the star is decaying exponentially.

iii. (3 points) Under which model, linear or exponential, does the star reach a radius of 0 miles the soonest?

#2. Consider the following graph of $f(x)$.



i. (4 points) What is the average rate of change between $x = 1$ and $x = 4$.

ii. (3 points) Approximate the intervals on which the function is increasing.

iii. (Bonus 2 points) Draw a rough sketch of $f'(x)$ on the graph above.

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i. (5 points) Give a formula for R in terms of t assuming the star is decaying linearly.

$$m = \frac{40-10}{0-105} = \frac{-30}{105} = -2/7$$

$$\Rightarrow R = \frac{-2}{7}t + 40$$

ii. (5 points) Give a formula for R in terms of t assuming the star is decaying exponentially.

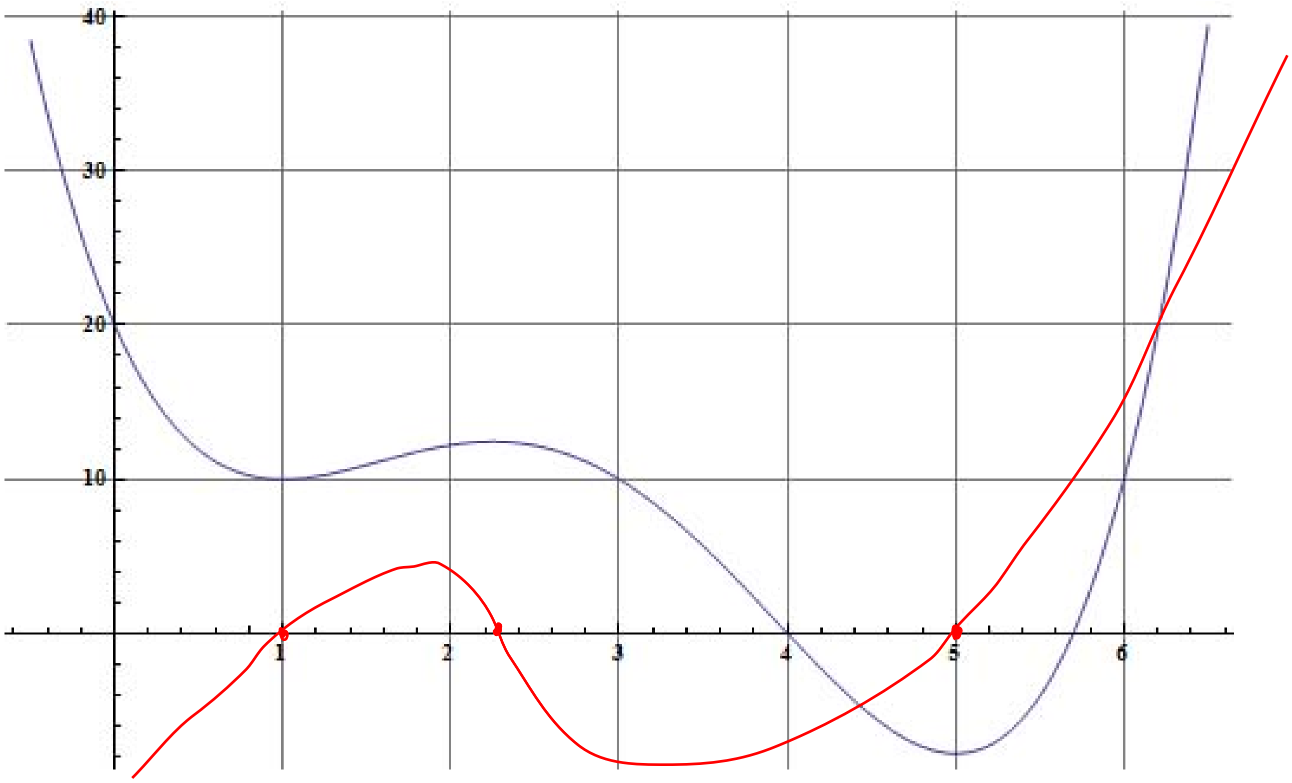
$$R = 40a^t \Rightarrow 10 = 40a^{105} \Rightarrow \frac{1}{4} = a^{105} \Rightarrow a = .987$$

$$\Rightarrow R = 40(.987)^t$$

iii. (3 points) Under which model, linear or exponential, does the star reach a radius of 1 mile the soonest?

Linear

#2. Consider the following graph of $f(x)$.



i. (4 points) What is the average rate of change between $x = 1$ and $x = 4$.

$$\frac{\Delta f}{\Delta t} = \frac{10 - 0}{1 - 4} = -10/3$$

ii. (3 points) Approximate the intervals on which the function is increasing.

$(1, 2.25)$ & $(5, \infty)$

iii. (Bonus 2 points) Draw a rough sketch of $f'(x)$ on the graph above.