

1. Hamster Zombies have invaded Sacramento! Currently there are 120,000 Zombie Hamster in Sacramento. The Governor has considered THREE different Zombie Hamster removal companies.

- **HAMSTER BUSTERS.** If hired, the hamster population will be $f(t) = 120000(.94)^t$ where “t” is time in year.
- **BILL AND ERNIE’S HAMSTER REMOVAL.** If hired, the hamster population will be $f(t) = 120000(.96)^{2t}$ where “t” is time in year.
- **BACK THAT HAMSTER UP.** If hired, the hamster population will be $f(t) = 120000(.989)^{6t}$ where “t” is time in year.

Given the options above, answer the following questions.

- Which company would remove the most Zombie Hamster in the first three years? Show your work. Back your answer up mathematically.*
- Which company’s DECAY/DECREASE more than 5% of the hamster population per year? Show your work. Back your answer up mathematically*

2. On March 30th, 2010, the magazine “Abbigails Adventures” had 10,400 subscribers. On March 30th, 2014, the magazine had 26,200 subscribers. Assume growth is exponential. Given that information, answer the following....

- What was the percent increase over the time period above?*
- What is the YEARLY percent increase (assume the increase is the same every year.)*
- Write a formula for number of subscribers with respect to time in years.*
- Use the formula to estimate the number of subscribers in 2012.*
- Use the formula to predict the number of subscribers in 2018.*

3. FOUR Hamster acrobats are launched from a platform of different heights, each following different trajectories.

HAMSTER ONE: “The Flying Fuzzball” travels a trajectory of $h(t) = -\frac{1}{2}(t-5)^2 + 75$ where $h(t)$ is height in feet and “ t ” is time in seconds.

HAMSTER TWO: “The Squeaking Scorcher” travels a trajectory of $h(t) = -0.5(t-20)(t+5)$ where $h(t)$ is height in feet and “ t ” is time in seconds.

HAMSTER THREE: “The Wiggling Wonder” travels a trajectory of

t	h(t)
0	65
2	73
4	65
6	53

where $h(t)$ is height in feet and “ t ” is time in seconds.

HAMSTER FOUR: “AL” Started 42 feet in the air and jumped to a MAX height of 56 feet from the ground. It took him 3 seconds to reach the max height.

Answer the following questions about the FOUR hamsters below....

- What Hamster started the highest from the ground? Justify your work mathematically.*
- What Hamster reached their highest height the fastest? Justify your work mathematically.*
- What Hamster reached the highest height? Justify your work mathematically.*

4. It's a HAMSTER RACE! Three hamsters line up at the starting line. The first hamster to go 15 meters, wins. Below are the functions of the hamster's distance $d(t)$ in meters with respect to time in seconds. You may use DESMOS to aid you in your calculations/solutions.

HAMSTER ONE: $d(t) = 3t$

HAMSTER TWO: $d(t) = t^2$

HAMSTER THREE: $d(t) = 2^t - 1$

a. What Hamster is winning the race after 1 second? Justify your work mathematically.

b. What Hamster is winning the race after 3 seconds? Justify your work mathematically.

c. List the winners of the race in order... Justify your work mathematically.

FIRST PLACE: _____

SECOND PLACE: _____

THIRD PLACE: _____