

1. Suppose you take out a car loan from the bank for the following amounts and interest rates. Write down a rate equation describing the situation, and then an exact solution.

(a) \$12000 at 6%

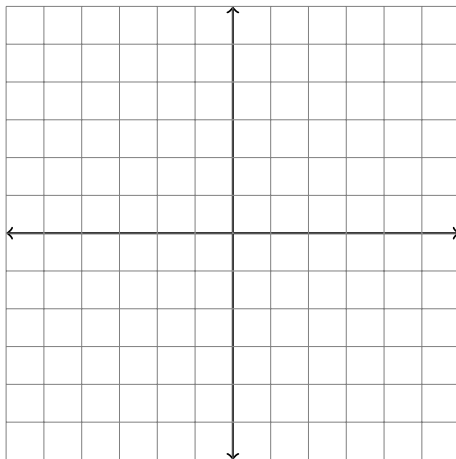
(b) \$30000 at 12%

(c) \$3000 at 20%

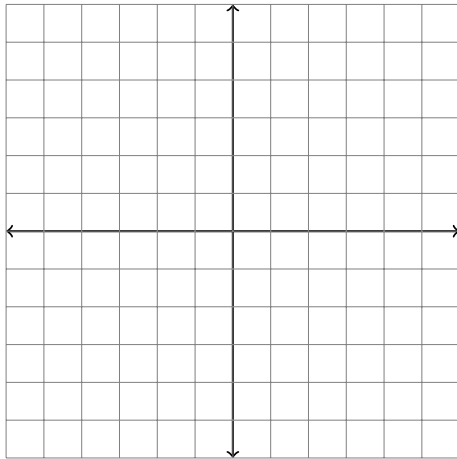
(d) \$10000 at 2%

2. Sketch solutions to the following rate equations.

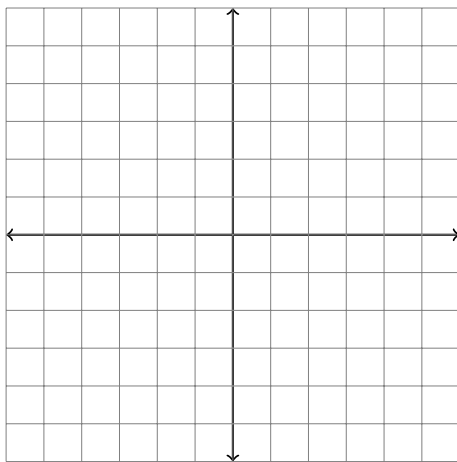
(a)  $f'(x) = 2f(x)$  and  $f(0) = 1$



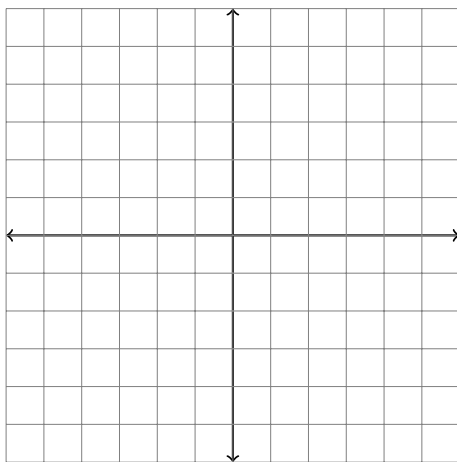
(b)  $f'(x) = f(x)$  and  $f(-2) = 1$



(c)  $f'(x) = -f(x)$  and  $f(-3) = 2$



(d)  $f'(x) = 2f(x)$  and  $f(0) = -1$



**3. A mysterious pond algae grows in a waste stabilization pond. When there is more than 10000 algae/liter, the pond will have to be drained and reset. Based on the following information, approximately how often will this process need to be performed?**

- over the course of a day, each algae grows and splits into 3 more algae.
- a freshly reset pond contains roughly 0.5 algae per liter.

**4. Rabbits are known for breeding rapidly: the average litter has 5 babies, and a female rabbit has around 4 litters a year. Suppose 20 rabbits are introduced to a new environment. How long will it take for there to be more than 3 million rabbits?**

**5. Certain dangerous proteins, called prions, refold other proteins into the same shape as themselves. Suppose 1 prion takes a day to fold 3 other prions out of ambient proteins. Starting with just 4 prions, how long will it take for there to be at least 20000 prions?**