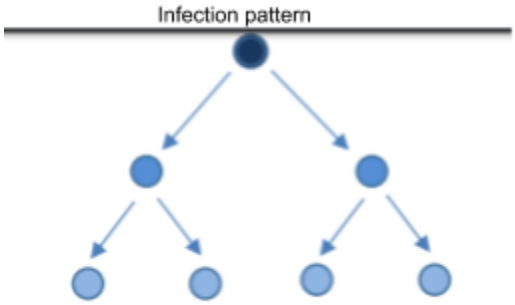
Examining Exponential Spread and the Effect of Social Distancing

Visuals and selected information from The Washington Post and https://www.edb.gov.hk/

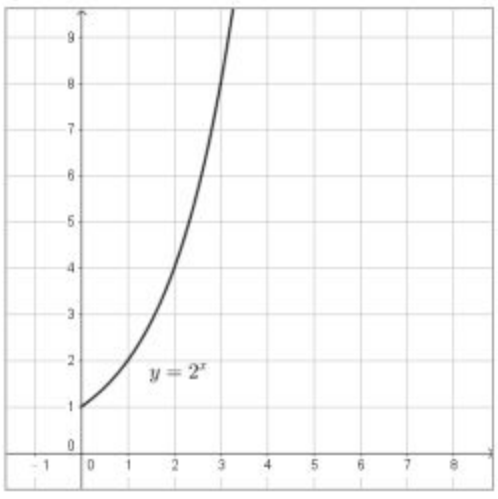
In this activity, we will model the spread of a faux disease we will call *Simulitis*. Like COVID-19, *simulitis* exhibits an exponential growth pattern.

Let's examine a simple epidemic model:

- The spread of the disease starts from an infected person.
- The person directly spreads the disease to two susceptible persons.
- The two new infected persons then each transmit the disease to two more persons (as in the following figure), and so on.
- The number of persons infected at each stage is a power of 2.



The number of persons infected at each stage is a power of 2. We can model the situation by the exponential function: $y=2^x$. Let's look at an exponential graph.



Exponential Graph

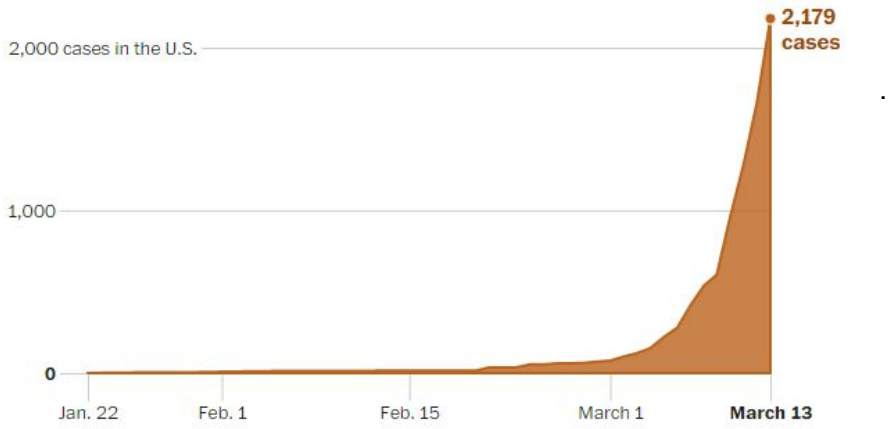
Questions:

What happens to the slope of this graph as time goes on?

What does this indicate about the rate of the spread of disease?

How many steps are needed to infect all the people in a classroom of 30 students? How about a whole school that holds 800 students?

When we first heard about COVID-19 there were only a few cases, but over the last two months, those numbers have increased quickly. The exponential curve of the virus (shown below) worries experts. If the number of cases doubles every three days, there would be about 100 *million* cases in the United States by May.



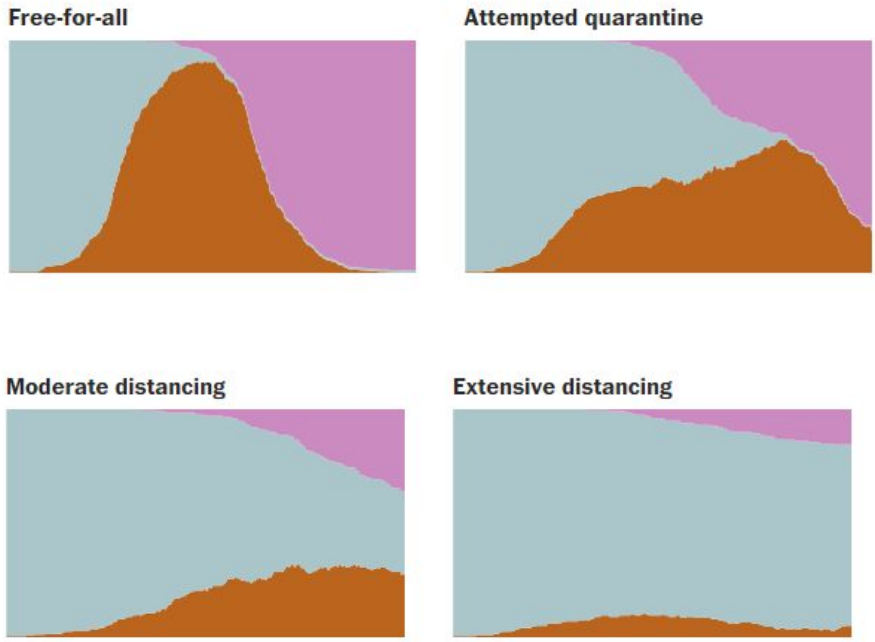
Number of COVID-19 cases from Jan 22-Mar 13 in the U.S.

Questions:

If the number of cases doubles every three days, how many cases would the U.S. have in 1 month (March 13 to April 13)?

If this number continues to double every three days, what do you predict will happen to the ability of hospitals to take in and treat patients?

The Spread of *Stimulus* and Social Distancing



Blue=healthy; Orange=sick; Purple=recovered