AP Calculus BC
Section 6.4 – Exponential Growth and Decay (FDWK)

1. (#11) Suppose that the cholera bacteria in a colony starts with 1 bacterium and doubles in number every half hour. How many bacteria will be in the colony at the end of 24 hours?

2. (#12) A colony of bacteria is grown under ideal conditions in a lab so that the rate of change of the population is proportional to the amount present at any time. At the end of 3 hours there are 10,000 bacteria. At the end of 5 hours, there are 40,000 bacteria. How many bacteria were present initially?

3. (#13) The half-life of radon-222 is 3.8 days. About how long will it take an amount of radon in a sealed sample of air to decay to 90% of its original value?

4. (#18) An aluminum beam was brought from the outside cold into a machine shop where the temperature was held at 65°F. After 10 minutes, the beam warmed to 35°F. Use Newton's Law of Cooling to estimate the beam's initial temperature.

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5. (#19) Suppose that a cup of soup cooled from 90°C to 60°C in 10 minutes in a room whose temperature was 20°C. Use Newton's Law of Cooling to answer the following:

   a. How much longer would it take the soup to cool to 35°C?

   b. Instead of being left in a room, the soup is put into a freezer whose temperature is –15°C. How long will it take the soup to cool from 90°C to 35°C?

6. (#20) The temperature of an ingot of silver is 60°C above room temperature right now. Twenty minutes ago, it was 70°C above room temperature. How far above room temperature will the silver be 15 minutes from now? 2 hours from now?

7. (#28) In some chemical reactions the rate at which the amount of a substance changes with time is proportional to the amount present. For the change of δ-glucono lactone into gluconic acid, for example, $\frac{dy}{dt} = -0.6y$, when y is measured in grams and t is measured in hours. If there are 100 grams of δ-glucono lactone present when $t = 0$, how many grams will be left after the first hour?

8. (#29) Suppose the electricity is draining from a capacitor at a rate proportional to the voltage V across its terminal and that, if t is measured in seconds, $\frac{dV}{dt} = -\frac{1}{40}V$. How long will it take the voltage to drop to 10% of its original value?