

Aim: What is Newton's Law of Cooling?**I. Do Now:**

- Find the equation of the exponential function containing the points $(4, \frac{112}{81})$ and $(-1, \frac{21}{2})$.
- The temperature of a fresh cup of coffee is 180°F (at time $t = 0$). Make a sketch of an exponential function showing the temperature of the coffee dropping to the room temperature of 76°F .

**II. Motivation:**

- The temperature of a fresh cup of coffee is 180°F and the room temperature is 76°F . After five minutes, the temperature of the coffee is 168°F .
 - Find an exponential function in the form $y = ab^t + c$ to represent this situation.
 - How long will it take for the coffee to reach a temperature of 155°F ?

III. Development:

When a hot object is left in surrounding air that is at a lower temperature, the object's temperature will decrease exponentially, leveling off towards the surrounding air temperature. This "leveling off" will correspond to a _____ in the graph of the temperature function.

Newton's Law of Cooling

$$T = C + (T_0 - C)e^{-kt}$$

where t = time (in minutes)

T = the temperature of the given object at time t

C = constant temperature of the surrounding medium (the ambient temperature)

T_0 = the initial temperature of the object

k = decay constant

IV. Applications:

- A pizza is taken out of a 425°F oven and placed on the counter to cool. The room temperature is 75°F . After two minutes, the temperature of the pizza is 248°F . Use Newton's Law of Cooling to write an equation representing the temperature of the pizza after t minutes.

