

2. [9 points] For a class project, Yennifer is studying the accumulation of dead leaves on the ground in a particular region on Nichols Arboretum.
- a. [4 points] She finds that the dead leaves accumulate at a constant rate of 6 grams per square centimeter per year. At the same time, the leaves on the ground decompose at a continuous rate of 80 percent per year. Write a differential equation for the total quantity Q of dead leaves, in grams per square centimeter, at time t , in years.

Answer: _____

- b. [5 points] Yennifer finds that if she covers the ground in purified muck, then the total quantity P , in grams, of dead leaves per square centimeter satisfies the differential equation

$$\frac{dP}{dt} = (P - 3) \cos(2\pi t)$$

In addition, when she first applies the muck (at $t = 0$), the ground is covered with 1 gram per square centimeter of leaves.

Use separation of variables to find a formula for $P(t)$. Show your work.

Answer: $P(t) =$ _____