

Name: \_\_\_\_\_

*Please take your time and answer each question clearly and carefully. For this quiz, you will not need a calculator. Do not use one.*

A new species of gopher has been discovered. Its population in a particular environment over time is given by the following formula:

$$G(t) = \frac{40t}{5t + 1} + 50(1 + e^{-0.2t}).$$

What is the initial population,  $G(0)$ ?

*Hint: Remember that  $e^0 = 1$ .*

1. What if we want to know the eventual population size as  $t \rightarrow \infty$ ? We will break the problem into two parts. First, consider the fractional part:
2. What is this limit?

$$\lim_{t \rightarrow \infty} \frac{40t}{5t + 1}$$

*Hint: If  $t$  is a really big number like a million, what happens?*

3. What about the other half of  $G(t)$ ?

$$\lim_{t \rightarrow \infty} 50(1 + e^{-0.2t})$$

*Hint: Don't forget the "50" !*

4. Add the previous two answers to find  $\lim_{t \rightarrow \infty} G(t)$ .