For problems 1 – 4, find k and the carrying capacity for the population represented by the differential equation.

1.
$$\frac{dP}{dt} = 0.04P - 0.0004P^2$$

$$2. \ \frac{50}{P} \frac{dP}{dt} = 2 - \frac{P}{250}$$

$$3. \quad \frac{dB}{dt} = 0.06B \left(1 - \frac{B}{100} \right)$$

4.
$$50\frac{dY}{dt} = 3Y - 0.03Y^2$$

- 5. (#17) A 2000-gallon tank can support no more than 150 guppies. Six guppies are introduced into the tank. Assume the rate of growth of the population is $\frac{dP}{dt} = 0.0015P(150 P)$.
 - a. What is *k* and the carrying capacity?
 - b. When is the population growing the fastest?
 - c. What is $\lim_{t\to\infty} P(t)$?
 - d. On what interval(s) is the population increasing at an increasing rate?
 - e. What is the largest rate of growth of the guppy population?
 - f. Find an expression for the population of guppies at any given time, t.
 - g. How long will it take for the guppy population to reach 100?

AP Calculus BC

Section 6.5 - Logistic Growth FDWK

- 6. (#18) A certain wild animal preserve can support no more than 250 lowland gorillas. Twenty-eight gorillas were know to be in the preserve in 1970. Assume the rate of growth of the population is $\frac{dP}{dt} = 0.0004P(250-P)$.
 - a. What is *k* and the carrying capacity?
 - b. When is the population growing the fastest?
 - c. What is $\lim_{t\to\infty} P(t)$?
 - d. On what interval(s) is the population increasing at a decreasing rate?
 - e. What is the largest rate of growth of the gorilla population?
 - f. Find an expression for the population of gorillas at any given time, *t*.

g. How long will it take for the gorilla population to reach 225?

AP Calculus BC Section 6.5 – Logistic Growth

) r problems 1-4, find k and the carrying capacity for the population represented by the differential equation.

1.
$$\frac{dP}{dt} = 0.04P - 0.0004P^{2} = M = 100$$

$$= .0004P(100-P)$$
2. $\frac{50'dP}{P} = \frac{2}{250} = \frac{P}{50}$

$$= \frac{1}{50} = \frac{1}{250} = \frac{1}{50} =$$

- 5. (#17) A 2000-gallon tank can support no more than 150 guppies. Six guppies are introduced into the tank. Assume the rate of growth of the population is $\frac{dP}{dt} = 0.0015P(150-P)$.
 - a. What is *k* and the carrying capacity?

- M = 120 K = . 552
- b. When is the population growing the fastest? P = 75
- c. What is $\lim_{t\to\infty} P(t)$?
- d. On what interval(s) is the population increasing at an increasing rate? $\bigcirc \leftarrow P < 75$
- e. What is the largest rate of growth of the guppy population? $\frac{df}{dt}\Big|_{p=75} = .0015 (75)(75)$ GUPPIES WK
- f. Find an expression for the population of guppies at any given time, t.

$$P = \frac{15D}{1+Ae^{-125}} + 1+A = \frac{190}{6} = 25$$

$$6 = \frac{15D}{1+A}$$

$$A = 24$$

$$P = \frac{15D}{1+24e^{-1225}}$$

g. How long will it take for the guppy population to reach 100?

$$100 = \frac{150}{1 + 24e^{-kt}} - kt = \ln\left(\frac{.5}{24}\right)$$

$$100 = \frac{150}{1 + 24e^{-kt}} - kt = \ln\left(\frac{.5}{24}\right)$$

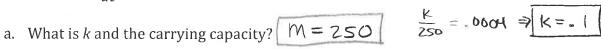
$$17.205 \text{ weeks}$$

de = k p (m-p) =

AP Calculus BC Section 6.5 – Logistic Growth

LET t=0 88 1970.

6. (#18) A certain wild animal preserve can support no more than 250 lowland gorillas. Twenty-eight gorillas were know to be in the preserve in 1970. Assume the rate of growth of the population is $\frac{dP}{dt} = 0.0004P(250-P)$.



b. When is the population growing the fastest? P = 125

c. What is $\lim_{t\to\infty} P(t)$? 2.50

d. On what interval(s) is the population increasing at a decreasing rate?

e. What is the largest rate of growth of the gorilla population?

f. Find an expression for the population of gorillas at any given time, t.

$$P = \frac{250}{1 + Ae^{-1}t}$$
 $A \approx 7.9285$
 $P = \frac{250}{1 + 7.9285e^{-1}t}$
 $28 = \frac{250}{1 + A}$
 $1 + A = \frac{250}{28} - 1$

g. How long will it take for the gorilla population to reach 225?

$$225 = \frac{250}{1+7.9285e^{-1}t}$$

$$1N ABOUT THE YEAR 2012$$

$$t = \frac{250}{A} = \frac{250}{42.6769}$$