

Math Xa
Worksheet—Differentiating Exponential and
Logarithmic Functions

Fall 2003

1. Find the derivative of each of the following functions.

(a) $y = x^e + \pi^x + e^\pi$

(b) $y = x \log_3 x$

(c) $y = \frac{1}{2} \ln x$

(d) $y = \ln \sqrt{x}$

(e) $y = \ln(x\sqrt{x})$

(f) $y = \ln \left(\frac{x^2 \sqrt{x}}{(x-2)(x+5)} \right)$

2. In early summer the fly population of Maine grows exponentially. The population at any time t (measured in days) can be given by $P = P_0 e^{kt}$ for some constant k . Suppose at some date, which we will designate as $t = 0$, there are 200 flies. Thirty days later, there are 900 flies.
- (a) Find P_0 and k .

 - (b) The mosquito population is also growing exponentially. At time $t = 0$ there are 100 mosquitos, and the mosquito population doubles every 10 days. Write a function $M(t)$ that gives the number of mosquitos at time t .

 - (c) When will the mosquito and fly populations be equal?

 - (d) Find $P'(t)$.

 - (e) Find $M'(t)$.

 - (f) Find the rate at which each population is growing when the two populations are equal. Which population is growing more rapidly?