

**Math Xa Fall 2003**  
**Worksheet: The Derivative of an Exponential Function**  
**November 10, 2003**

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

(a)  $y = xe^{10x}$

(b)  $f(t) = e^t + e^\pi + \pi^e$

(c)  $x(t) = \frac{t^3 - 2t + 4}{e^{3t} + 2}$

(d)  $y = \frac{e^x - e^{-x}}{2}$

(e)  $f(x) = (x^2 - 2x + 5)e^x$

2. Find the equation of the line tangent to  $f(x) = e^x$  at  $x = 1$ .

3. Money in a bank account is growing exponentially. When there is \$4000 in the account, the account is growing at a rate of \$100 per year. How fast is the money growing when there is \$5500 in the account?

4. Consider the function  $f(x) = \frac{x^2}{e^x}$ .

(a) Compute and simplify  $f'(x)$ .

(b) For what values of  $x$  is  $f(x)$  increasing? Decreasing? Give exact answers.

(c) What is the smallest value ever taken by  $f(x)$ ? Explain your reasoning.