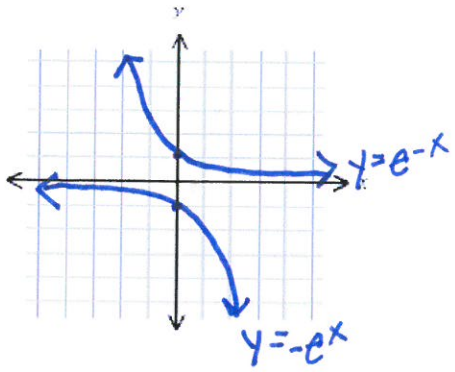
***AAT (IC/HW)-Day 1**
Chapter 5: 5-2 Natural Exponential Functions

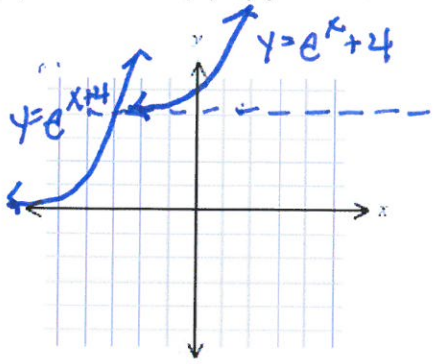
Name Key
Date: _____ Period: _____

Use the graph of $y = e^x$ to help sketch the graph of f.

1. (a) $f(x) = e^{-x}$ (b) $f(x) = -e^x$



2. (a) $f(x) = e^{x+4}$ (b) $f(x) = e^x + 4$



If P dollars is deposited in a savings account that pays interest at a rate of r% per year compounded continuously, find the balance after t years.

3. $P = 1000$, $r = 8\frac{1}{4}$, $t = 5$

$A = Pe^{rt}$
$= 1000e^{(.0825)(5)}$
$\approx \$1510.59$

How much money, invested at an interest rate of r% per year compounded continuously, will amount to A dollars after t years?

4. $A = 100{,}000$, $r = 11$, $t = 18$

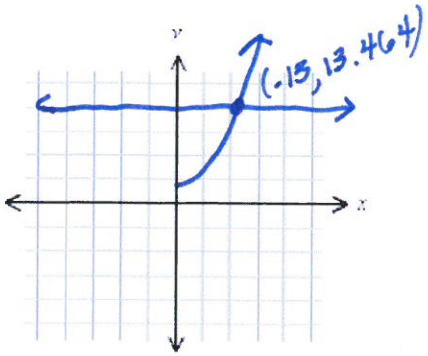
$100{,}000 = Pe^{(.11)(18)}$

$P = \frac{100{,}000}{e^{1.98}}$

$\approx \$13{,}806.92$

An investment of P dollars increased to A dollars in t years. If interest was compounded continuously, find the interest rate.

5. A = 13,464, P = 1000, t = 20



$13,464 = 1000e^{r(20)}$

$13.464 = e^{20r}$

$r = 13\%$

$\begin{bmatrix} .01 \\ 1 \\ .001 \end{bmatrix} \begin{bmatrix} -10 \\ 15 \\ 1 \end{bmatrix}$

Solve the equation.

6. $e^{(x^2)} = e^{7x-12}$

$x^2 = 7x - 12$; $x^2 - 7x + 12 = 0$; $(x-4)(x-3) = 0$; $x = 4, 3$

Find the zeros of f.

7. $f(x) = xe^x + e^x$

$e^x(x+1) = 0$

$x = -1$; $e^x \neq 0$

8. $f(x) = -x^2e^{-x} + 2xe^{-x}$

$xe^{-x}(-x+2) = 0$

$x = 0, 2$; $e^{-x} \neq 0$

9. $f(x) = x^3(4e^{4x}) + 3x^2e^{4x}$

$x^2e^{4x}(4x+3) = 0$

$x = -\frac{3}{4}, 0$; $e^{4x} \neq 0$

Simplify the expression.

10. $\frac{(e^x - e^{-x})^2 - (e^x + e^{-x})^2}{(e^x + e^{-x})^2} = \frac{(e^{2x} - 2 + e^{-2x}) - (e^{2x} + 2 + e^{-2x})}{(e^x + e^{-x})^2} = \frac{-4}{(e^x + e^{-x})^2}$

11. The 1980 population of the U.S. was approximately 227 million, and the population has been growing continuously at a rate of 0.7% per year. Predict the population N(t) in the year 2010 if this growth trend continues.

$2010 \rightarrow t = 2010 - 1980 = 30$

$P_0 = 227$

$r = .007$

$N(t) = 227e^{.007t}$

$N(30) = 227e^{(.007)(30)}$

$= 227e^{.21} \approx 280$ million

12. Under certain conditions the atmospheric pressure p (in inches) at altitude h feet is given by $p = 29e^{-0.000034h}$. What is the pressure at an altitude of 40,000 feet?

$h = 40{,}000$

$P = 29e^{-.000034(40{,}000)}$

$= 29e^{-1.36}$

≈ 7.44 in.

13. In 1978, the population of blue whales in the southern hemisphere was thought to number 5000. Since whaling has been outlawed and an abundant food supply is available, the population N(t) is expected to grow exponentially according to the formula $N(t) = 5000e^{0.0036t}$, where t is in years and t = 0 corresponds to 1978. Predict the population in the year 2010.

$2010 \rightarrow t = 2010 - 1978 = 32$

$N(32) = 5000e^{(.0036)(32)} \approx 5610$