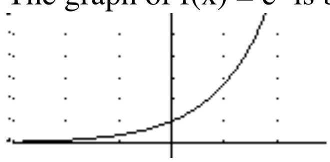
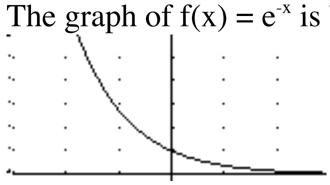
1. The **exponential function** f(x) with base *a* is expressed as:
   $f(x) = a^x$, where $a > 0$, $a \neq 1$, and x is any real number.

2. Graph of $y = e^x$, a new **<u>Parent Function</u>**, has a horizontal asymptote on the left side.
   $\lim_{x \to -\infty} f(x) = 0$ The horizontal asymptote is: y = 0 (the x-axis)
3. e is called the **<u>Natural Base</u>** and is an irrational number
4. We will use the 10-digit approximation: $e \approx 2.718281828$ and it must be **<u>memorized</u>**.

5. This parent function has a y-intercept at 1.
6. The graph of $f(x) = e^x$ is below:

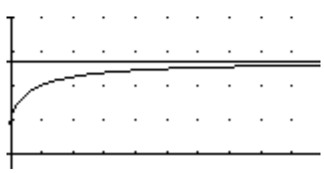


7. If we replace the x with –x, we get a reflection about the y-axis.
8. The graph of $f(x) = e^{-x}$ is below:



9. Mathematically e can be calculated by $e = \lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x$

10. We can see this using a calculator by placing $Y1 = \left(1 + \frac{1}{x}\right)^x$ and $Y2 = e^{(1)}$ and viewing the graph as x gets larger.



11. An application of the exponential function are the Compound Interest Formulas:
    $A = P\left(1+\frac{r}{n}\right)^{nt}$ For Discrete Compounding, and $A = Pe^{rt}$ For Continuous Componding where:
    A = the amount for the balance in your account,
    P = the principal (The Amount Invested)
    r = the annual interest rate (Usually given as a Percent that must be changed to a Decimal)
    t = the number of years the interest is accruing
    n = the number of compoundings per year.

12. $\lim_{n \to \infty} P\left(1 + \frac{r}{n}\right)^{nt} = Pe^{rt}$

13. Given: \$9000 is invested at an annual interest rate of 2.5%, compounded annually. Find the balance in the account after 5 years.
P = 9000, r = 2.5% = 0.025, n = 1 (Compounded once per year), t = 5 years

$$A = 9000\left(1 + \frac{0.025}{1}\right)^{1(5)} = 9000(1.025)^5 \approx \boxed{\$10{,}182.67}$$

14. Given: \$9000 is invested at an annual interest rate of 2.5%, compounded Quarterly. Find the balance in the account after 5 years.
P = 9000, r = 2.5% = 0.025, n = 4 (Compounded 4 times per year), t = 5 years

$$A = 9000\left(1 + \frac{0.025}{4}\right)^{4(5)} = 9000(1.00625)^{20} \approx \boxed{\$10{,}194.37}$$

15. Given: \$9000 is invested at an annual interest rate of 2.5%, compounded continuously. Find the balance in the account after 5 years.
P = 9000, r = 2.5% = 0.025, t = 5 years

$$A = 9000\, e^{(0.025)(5)} = 9000\, e^{0.125} \approx \boxed{\$10{,}198.34}$$

Assignment 126
Page 193, #'s 17, 19, 22, 49, 53, 58, 61, 66, 68