MATH 11010: Exponential Functions
Section 4.2

- **Exponential functions**: The function \( f(x) = a^x \), where \( x \) is a real number, \( a > 0 \) and \( a \neq 1 \), is called an exponential function with base \( a \).

- **Properties of the graph of** \( f(x) = a^x \), \( a > 0, a \neq 1 \)
  
  * Domain is all real numbers.
  * Range is \((0, \infty)\).
  * Always crosses through the point \((0, 1)\).
  * \( y = 0 \) is a horizontal asymptote.
  * The function is one-to-one.
  * If \( a > 1 \), then the function is increasing; if \( 0 < a < 1 \), then the function is decreasing.

**Example 1**: Sketch the graph of the following functions.

(a) \( f(x) = 2^{x-1} + 3 \)  
(b) \( f(x) = \left(\frac{1}{4}\right)^{x+2} - 1 \)
• **Compound Interest**: The amount of money $A$ that a principal $P$ will grow to after $t$ years at interest rate $r$ (in decimal form), compounded $n$ times per year, is given by the formula:

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

**Example 2**: If $4000 is borrowed at a rate of 16% interest per year, compounded quarterly, find the amount due at the end of 4 years? 8 years?

**Example 3**: If $3000 is borrowed at a rate of 12% interest per year, find the amount due at the end of 5 years if the interest is compounded annually? monthly? daily?

**Homework**: pp 370-371; 5-10 all, 27–53 odd.